European Mathematical Society

December 2001 *Issue 42*

ISSN 1027 - 488X

NEWSLETTER

EUROPEAN MATHEMATICAL SOCIETY

NEWSLETTER No. 42

December 2001

Designed and printed by Armstrong Press Limited
Crosshouse Road, Southampton, Hampshire SO14 5GZ, UK
telephone: (+44) 23 8033 3132 fax: (+44) 23 8033 3134
Published by European Mathematical Society
ISSN 1027 - 488X

NOTICE FOR MATHEMATICAL SOCIETIES

Labels for the next issue will be prepared during the second half of February 2002. Please send your updated lists before then to Ms Tuulikki Mäkeläinen, Department of Mathematics, P.O. Box 4, FIN-00014 University of Helsinki, Finland; e-mail: makelain@cc.helsinki.fi

INSTITUTIONAL SUBSCRIPTIONS FOR THE EMS NEWSLETTER

Institutes and libraries can order the EMS Newsletter by mail from the EMS Secretariat, Department of Mathematics, P. O. Box 4, FI-00014 University of Helsinki, Finland, or by e-mail: (makelain@cc.helsinki.fi). Please include the name and full address (with postal code), telephone and fax number (with country code) and e-mail address. The annual subscription fee (including mailing) is 65 euros; an invoice will be sent with a sample copy of the Newsletter.

EMS Committee

EMS Agenda

2002

9-10 February
EMS Executive Committee Meeting in Brussels (Belgium), at the invitation of the Belgian Mathematical Society and the Université Libre de Bruxelles

15 February
Deadline for submission of material for the March issue of the EMS *Newsletter*
Contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

24-28 February
EMS Summer School in Eilat (Israel)
Title: Algebraic Geometry, Computations and Applications
Contact: Mina Teicher, *e-mail: teicher@macs.biu.ac.il*

1 March
Deadline for Proposals for 2003 EMS Lectures
Contact: David Brannan, *e-mail: d.a.brannan@open.ac.uk*

15 May
Deadline for submission of material for the June issue of the EMS *Newsletter*
Contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

19-31 May
EMS Summer School in Craiova (Romania)
Title: Mathematical and numerical methods in computational quantum chemistry
Contact: Yvon Maday, *e-mail: maday@ann.jussieu.fr*

31 May
Executive Committee meeting in Oslo (Norway)

1-2 June
EMS Council Meeting, Oslo

3-8 June
Abel Bicentennial Conference, Oslo

28-29 September
Executive Committee meeting in Stockholm (Sweden)

2003

10-13 February
EMS-SMAI-SMF Meeting in Nice (France)
Title: Mathématiques Appliquées - Applications des Mathématiques (Applied Mathematics - Applications of Mathematics)
Contacts: Doina Cioranescu and Mireille Martin-Deschamps,
e-mail: cioran@ann.jussieu.fr and *mmd@math.uvsq.fr*

2004

25-27 June
EMS Council Meeting, Stockholm (Sweden)

27 June - 2 July
4th European Congress of Mathematics, Stockholm

Editorial

Thomas Hintermann

(Publishing Director, EMS Publishing Division)

The idea for the EMS to engage in publishing activities is probably almost as old as the society itself. It resulted, most notably, in the creation in 1999 of JEMS, the *Journal of the European Mathematical Society*, currently published on behalf of the EMS by Springer-Verlag, now a member of the Bertelsmann Springer group. Just about the same time, the first serious plans emerged to run a commercially operating publishing house. Among the available options, including taking over an independent publisher or combining the efforts of member society publishers, the EMS eventually decided to launch their own enterprise. Although this possibility had already been hinted at in the EMS *Newsletter*, the intention was first communicated to a large audience by the EMS President, Rolf Jeltsch, during his speech at the closing ceremony of the ECM in Barcelona in July 2000. In the interim, much energy has been spent on the legal aspects of the undertaking, hopefully culminating in the registration of the European Mathematical Foundation, the governing body of the EMS publishing house, with the Swiss chamber of commerce in late 2001.

An increasing proportion of the mathematical community is dissatisfied with the mathematical publishing industry. Above all, it is the pricing policy of some large and important commercial publishers that is under debate, and there is a general feeling that they hinder the dissemination of mathematical knowledge rather than foster it. Be that as it may, there is certainly no denying that at present the order of the day in every company is to meet short-term (short-sighted?) targets, most often at the expense of everything else. Financial considerations are clearly given first priority, and editorial matters and publishing aspects rank second. One of the aims of the EMS publishing house is to reverse that order. The needs of the community are foremost in our minds, admittedly with the obligation to run an economically sound operation.

I do not share the view that scientific information should be entirely free. To quote John Ewing of the American Mathematical Society, nothing is for free and the question is only who is paying. The collecting, editing and publishing of scientific content will always entail labour that belongs in the hands of professionals, rather than of scientists who should be able to devote themselves to research and teaching. Such a sharing of responsibilities is effective and in the interest of us all. Rather than depending on external funding, on volunteers, and on direct or indirect support from University institutions, we believe that financial independence is the best option for long-term sustainability. In other words, our publications will not be free, but available at the minimal price possible under market conditions. Everything spent on them will be fully reinvested in the publishing house. With the purchase of a book or the subscription of a journal you will support an endeavour that has your interests in mind. No payments are made to shareholders, and any profits have to be used on aims set down in the statutes of the Foundation.

Thomas Hintermann

We expect that the first publications of the EMS to appear under their own name will be published at the beginning of 2004, possibly earlier. We intend to publish first-quality peer-reviewed journals, and books on all academic levels and from all fields of mathematics, emphatically including applied mathematics. Proposals are welcome and should be submitted to the address below. We appeal to all mathematicians to support our effort by publishing with us, and by endorsing the subscription of our journals and the purchase of our books by the library of your home institution. We promise to pay back your confidence with the best possible service and quality.

Although the EMF is legally a separate structure from the EMS, the statutes and by-laws of the foundation ensure the decisive influence of the EMS, through the participation of committee members in the board of trustees. Moreover, the editorial boards of our journals and book series will consist of mathematicians approved by, and sympathetic with, the aims of the EMS.

You will be informed on the progress of our plans in the EMS *Newsletter*. Apart from the creation of its own publishing house, the EMS continues to offer a large and well-maintained collection of non-commercial journals and books on EMIS, the European Mathematics Information Service (*www.emis.de*).

Dr. Thomas Hintermann is at the Department of Applied Mathematics, ETH-Zentrum FLI C1, CH-8092 Zürich, Switzerland;
e-mail: hintermann@math.ethz.ch
tel:+41 1 632 34 36, fax +41 1 632 11 04

The Citation Checker and Cross Reference Link Generator offered by *Zentralblatt MATH*

Bernd Wegner

For quite a long time *Zentralblatt MATH* has offered the facility for exporting BIBTEX-files to users' machines from the hit list obtained by retrieving information from the *Zentralblatt MATH* database. This has turned out to be a useful tool for authors preparing a list of references for their articles. Responding to frequent demand, *Zentralblatt MATH* now provides an additional new service, in order to allow you to check your article literature references conveniently and quickly, and to provide persistent links to individual *Zentralblatt MATH* database items. This tool is freely available and will be soon extended to the *Jahrbuch* database.

The search menu for the citation checker is available under the URL *http://www.emis.de/ZMATH/x-ref.html*. Users will be requested to enter information on the citation item in four fields: last name of (first) author, significant word in the title, volume number, first page. This will be sufficient in nearly all cases to pinpoint the single item looked for – in particular, when all four fields are used. In the rather unlikely case that more than three items match the search criteria, the most recent three items are displayed. If the requested item does not belong to them, then the standard retrieval forms for *Zentralblatt MATH* may provide further help for those who have a subscription to this service.

The search result will offer precise standardised bibliographic data, to be exported by the user into his own referencing system. The addition of the *Zentralblatt MATH* annotation number will add a unique identifier for the article, which will be suitable as a persistent link to the electronic offer of this publication and may serve as a tool for reference linking going to a wider range than provided by DOI, for example.

Bernd Wegner, TU Berlin, Fakultät II, Institut für Mathematik, 10623 Berlin, Germany; e-mail: wegner@math.tu-berlin.de

Executive Committee Meeting

Berlin, 1-2 September 2001

Present: Rolf Jeltsch (President, in the Chair), David Brannan, Bodil Branner, Victor Buchstaber, Doina Cioranescu, Luc Lemaire, Olli Martio, Renzo Piccinini, Marta Sanz-Sole and Mina Teicher; (by invitation) Carles Casacuberta, Tuulikki Makelainen, David Salinger and Bernd Wegner; (by invitation to part of the meeting) Peter Deuflhard, Tony Gardiner, Thomas Hintermann, Ari Laptev, Christian Mehl and Rudolf Straesser.

The President thanked Bernd Wegner and Barbara Strazzabosco for the efficient and pleasant local arrangements.

Officers' Reports

The President sent a personal card of condolences to the family of J.-L. Lions. A conference dedicated to J.-L. Lions will be held at Collège de France, Paris, in July 2002.

An Abel Prize has been established, with an endowment fund of 200,000,000 NOK, the annual yield covering the prize of 300,000 annually.

A bid from the Swiss Mathematical Society to hold ICIAM 2007 in Zürich was successful. Rolf Jeltsch will be the local organiser, and the EMS will be actively involved.

Colette Laborde has been appointed to the Education Committee, Chris Budd to the RPA (Raising the Public Awareness of Mathematics) Committee, and Kouli Kyriaki to the Committee on Women and Mathematics. The Euler International Mathematical Institute has been accepted as a member of ERCOM (European Research Centres in the Mathematical Sciences).

There was a brief discussion of the new proposal for the *6th Framework Programme of the European Union*, which will be voted on in 2002. Networks and Euroconferences are included as fundable; it might also be possible to support activities in EU-Associated States (these do not include Russia) in this way. It was felt that the EMS might set up a small office in Brussels to coordinate its EU-related activities.

35 people had attended an *EMS Brainstorming Weekend on Applied Mathematics* in Berlingen on 4-6 May 2001. Rolf Jeltsch proposed a meeting to be held in Berlingen in Spring 2002 to discuss publishing, meetings, EU funding for mathematics conferences and integrated initiatives. It was thought that societies tended to send high-quality people with real commitment to such meetings. Several representatives of the EC would also attend.

The *Treasurer* reported that the Society's finances were under control. Expenditure in 2000 has been higher than average, due to the Council meeting in Barcelona. The costs of the *Newsletter* were quite high because of the strength of sterling against the euro.

A list of new individual EMS members (see later in this *Newsletter*) was approved.

Projects

A report was received on the May meeting of the *Zentralblatt für Mathematik Consultative Committee* in the headquarters of FIZ-Karlsruhe. The financial situation of *Zentralblatt* was improving. Bernd Wegner was praised for his work for *Zentralblatt*, particularly in relation to the consortia arrangements. The pricing for *Zentralblatt* for the year 2002 had now been agreed: there will be a slight increase in prices, with no lower price for the printed version only. It was noted that the German government gives financial support to *Zentralblatt* and that more international financial help should be sought in the future. The ownership of the *Zentralblatt* title is shared between the EMS, FIZ, Springer and the Heidelberg Academy of Science

A report on the LIMES (*Large Infrastructure in Mathematics - Enhanced Services*) project revealed that good progress had been achieved so far, and a first release of new software would come out soon.

A final report was received on the *Reference Levels for 16-year-olds* project; the objective has been to identify some common standards for levels of understanding of mathematics across European countries at the particular age of 16. A short conference on the project outcome had been held in Luxembourg, and it was planned to hold a briefing in Brussels for EU Commission staff. There was a lengthy discussion of a possible similar project for 18-year-olds.

EMF/EMS Publishing House

The first meeting of the Board of Trustees of the EMF (*European Mathematical Foundation*) had been held in Zürich in July, and a report of its discussions was received by the Committee. The EMF is a not-for-profit trust that is the legal entity responsible for the work of the new EMSph (*European Mathematical Society Publishing House*). Its Chair is Rolf Jeltsch, with Olli Martio as Treasurer, David Brannan as Secretary and Eduard Zehnder (ETH) as the other trustee. The by-laws and tax status of the EMF were discussed at the Board meeting.

EMF has appointed Thomas Hintermann (formerly with Birkhäuser-Verlag, and with 12 years' experience of publishing mathematics) as the launch

Managing Director of EMSph, and he took up his post on 1 September. In a wide-ranging briefing to the Executive Committee, Thomas Hintermann noted that the rationale for the EMSph had been the widespread dissatisfaction of mathematicians with the work and prices of many commercial publishers. In addition, a regular income from publishing would help to give the EMS financial stability. His view was that there would always be a need for publishers, as it is not a good use of mathematicians' own time to divert it into such technical and time-consuming matters.

There was some daiscussion of the wide range of models for collaboration that the EMSph might follow, depending on individual negotiations with each proposed partner. The EMSph would be active in

Carles Casaculberta

publishing journals, individual books and series of books.

EMIS

There was a discussion led by Christian Mehl and Volker Mehrmann on the present status of *the left-hand side of EMIS*. Arrangements were to be set up for ensuring that changes in the EMS committee memberships should appear on EMIS.

The idea of setting up some sort of *job information* site on EMIS had proved an impossible task; it was thought that an e-letter (weekly or monthly) could be a better method for disseminating information, and that this could be discussed at Berlingen. Volker Mehrmann and Christian Mehl were thanked warmly for their work on EMIS.

ElibM

Three journals had been made available recently on ElibM: *Advances in Geometry* (de Gruyter), *CMAM* (Byelorussia) and *AMEN* (Taiwan). The installation of *Annals of Mathematics* was in hand, due to the efforts of Larry Siebenmann. The same privileges were given as for the arXiv. There would be no longer be a five years' delay. The first years' issues of *JEMS* would shortly be made freely accessible on EMIS.

As announced previously, new developments in the publication of commercial mathematical journals and the dominating role of electronic versions may force the dual journals in EMIS to charge for access to the current electronic publications. For these journals, such a possibility will be arranged on a separate server providing access control facilities; no charging will take place on EMIS itself.

Electronic content with charged access will be made freely accessible in ElibM, after some period to be decided by each individual dual journal. During the charged period, ElibM will provide free access to bibliographic data and abstracts. Distribution of the metadata to the mirrors will happen immediately after availability. The papers themselves will be given to the mirrors as soon as they are freely available.

In relation to the archiving of electronic content, the authenticity of electronic versions of papers will be an important issue. The CEIC (Committee on Electronic Information and Communication) had been requested to develop a general recommendation in the direction of fixing a date after which a paper could not be further altered without its becoming a separate publication.

In future, PDF files will be requested as common standard for ElibM, to provide easier readability of the files. As a consequence of the large number of journals in ElibM, access facilities to the content need to be improved, giving an alternative to just clicking through contents. This will require more standardised delivery of metadata.

Linking references with electronic or retro-digitised versions is an important quality issue for electronic publications. The journals in ElibM are likely to move to such an enhancement, and electronic document identifiers will be needed for this.

The DOI used by commercial publishers for current electronic publications is a relatively expensive solution [DOI = *Digital Object Identifier*, see *http://www.doi.org*]; it will be possible to use the ZBL-annotation numbers for this. There is an initiative to produce a matching list between ZBL and MR annotations; for older items, the *Jahrbuch* identifiers may be used. ZBL and the AMS have agreed to create a matching list of identifiers for papers; this will be cheaper than DOI.

EMIS has mirrors at SUB Göttingen and the Cornell University Library; they were installed for looking after later archiving of articles and books in EMIS. With more than five years of electronic volumes available for most journals in ELibM, archiving needs to be established in a more systematic way. This fits into a new initiative called EMANI (Electronic Mathematics Archiving Initiative), where SUB Göttingen and the Cornell University Library are partners, in which the TeX-source codes and the PDF files are the basis for archiving. This cooperation between libraries and journals will have to be established in every single case, journal by journal, establishing a series of contracts.

Retro-digitising will improve the availability of electronic offers in mathematics. Most dual journals in ELibM have such extended offers already, thanks to participation in the ERAM-project. These activities are guided by SUB Göttingen and TU Berlin, the latter represented by Bernd Wegner.

JSTOR offers more than 120 retro-digitised journals in science. Between 10 and 20 of them offer a lot of mathematical content. [JSTOR = *Journal Storage. The Scholarly Journal Archive*: see *http://www.jstor.org* or *http://www.jstor.ac.uk*].

EMANI (*Electronic Mathematics Archiving Initiative*) is a cooperation between publishers, editors and libraries, with the goal of caring about the long-term archiving and availability of electronic content in mathematics. The main contributors from the publishers' side are Birkhäuser and Springer-Verlag, but publications in ElibM may also take part in this initiative. A start on the archiving will be made by the Tsinghua University Library, the SUB Göttingen and the Cornell University Library.

The Mathematical Heritage proposal

Marta Sanz-Solé

encourages mathematicians to make all their research papers available on the web. Martin Grötschel and Peter Michor both have proposals in this direction.

There will be a satellite conference of ICM 2002 on *Electronic Information and Communication in Mathematics* at Tsinghua University in Beijing; the organisers will be Fengshan Bai and Bernd Wegner. ElibM and other projects in EMIS will be included among the subjects presented there. Details of the conference can be found on the ICM home page.

EMS Committees

A new Chairman for the *Committee on Developing Countries* is being sought. It was thought that the Committee might decide to look afresh at its terms of reference.

The composition of the *Committee for the Support for Eastern and Central European Mathematicians* was agreed as follows: Andrzej Pelczar (Chair), Victor Buchstaber, Martin Fuchs, Michel Hazewinkel, George Jaiani, Laszlo Marki, Olli Martio and V.V. Sharko.

The topic of the *Special Events Committee*'s Fifth Diderot Mathematical Forum (5DMF) on 22-23 November 2001, was to be *Mathematics and Telecommunications*, with special emphasis on cellular phones. The cities and institutions involved would be: Philips Research (Eindhoven, Netherlands), Helsinki

University of Technology (Finland) and École Polytechnique Federale de Lausanne (Switzerland). The format would be as usual, with two days of meetings (their length will depend on the site) and three one-hour lectures (including questions) shared between all three sites. The lectures would be given by Joachim Hagenauer (Technical University, Munich) in Eindhoven, Yrjo Neuvo (Nokia) in Helsinki, and Jacob Ziv (Technion Haifa) in Lausanne.

Two other events, which could lead to

Tony Gardiner

'special events' that the EMS might take up as opportunities to celebrate the impact of mathematics, are connected with the birth centenaries of John von Neumann (in 2002) and A.N. Kolmogorov (in 2003). The Special Events Committee was encouraged to proceed with investigating these projects.

Saul Abarbanel (Israel) was elected to chair the *Committee for Applied Mathematics* for 2002-5; his subject area is numerical hyperbolic PDEs. It was felt essential that all strands of applied mathematics should be represented in this EMS committee, that corporate members should be consulted on its membership, that no member had a right to specify a member of the committee, and that there should always be adequate representation of applied mathematics and of this committee on the EC.

It was agreed that the EMS *Summer Schools Committee* should write guidelines for potential organisers of EMS summer schools. These should indicate that there are a limited number of speakers, that the duration is at most 2 weeks, that it can be for new postgraduates as well as for postdoctoral mathematicians, and it should outline the differences between a conference and a summer school.

The *St Petersburg Summer School*, 9-22 July 2001, had been devoted to mathematics and mathematical physics. The number of participants had been 78, and the school was considered a success. Financial support had been received from the EMS, UNESCO, NATO and the Russian Foundation for Basic Research. Its *Proceedings* will be published by Kluwer and Springer.

The *Prague Summer School* had 88 participants. Financing had been obtained from the Czech Republic, ESF, AMIF, the International Visegrad Fund, and a guarantee of 2000 euro from the EMS; an application to UNESCO-Roste was still pending.

The *EAGER-ENI-EMS Summer School on Computational Algebraic Geometry and Applications* will be held in Eilat (Israel) on 24-28 February 2002. The school includes an introduction on how to use computer algebra systems such as SINGULAR and MACAULAY2 and packages such as SCHUBERT (intersection theory) for research in algebraic geometry and its applications. The programme consists of lectures and practical exercise sessions in front of a computer. (EAGER is the European Algebraic Geometry Education and Research, and ENI is the Emmy Noether Research Institute for Mathematics at Bar-Ilan University and the Minerva Foundation.)

The *EMS Summer School on Computational Aspects of Fluid Mechanics* will be held on 8-19 July 2002, in Brasov (Romania).

Plans for Summer Schools in 2003-5 were also considered, as was the possibility of applying to the EU for funding for the 2003 summer schools.

The *2002 EMS Lecturer* will be Professor Gianni Dal Maso of the International School for Advanced Studies (SISSA) in Trieste (Italy).

It was agreed to add Antoine Bodin (Besançon) and Philippe Tilleuil (CREM) to the membership of the *EMS Education Committee*.

Michele Emmer was added to the membership of the *Committee for Raising Public Awareness of Mathematics*.

The Executive Committee decided to set up a *General Meetings Committee*, with Luc Lemaire in the Chair (EU); the other members would be Renzo Piccinini (summer schools), Rolf Jeltsch, Jean-Pierre Bourguignon (DMF), Ana Bela Cruzeiro (SPM), Michael Sorensen (Bernoulli Society) and Mina Teicher (EMS Executive Committee). Among other ideas, the committee should discuss EU 6th Framework Programme funding for EMS meetings, and the possibility that the EMS hold regional meetings with member societies.

Berlingen Declaration

Sebastia Xambo had written an interesting report on the Berlingen meeting for the June EMS *Newsletter*. In short, the declaration is as follows:

1. The presence of applied mathematics in EMS bodies and policy decision making should be significantly increased.
2. The EMS Applied Mathematics Committee must be kept an active body for the time being. Its mission statement should be adapted to the new role of the committee. Its Chair should be invited to the Executive Committee meetings.
3. Pure and applied mathematics should be equitably represented in the publications of the EMS.
4. Special interest groups should be created gradually inside EMS.
5. The EMS should consider increasing its activities by collaborating with international, national and regional societies in organising meetings.
6. The EMS should further develop its Summer School Programme, and should continue to include topics in both pure and applied mathematics.
7. The EMS should work towards the goals that
   (a) students majoring in mathematics should be exposed to applications of mathematics in the sciences or in other areas;
   (b) high-school teachers should have adequate education in applied mathematics and mathematical modelling.
8. The EMS should formulate a position with regard to the Bologna declaration of 1999.
9. The EMS should continue to raise public awareness of mathematics; the EMS should promote local initiatives, encourage collaboration with various organisations, and collect and disseminate information on initiatives of member societies in this area.

The declaration was accepted as a positive statement, which the EC will endeavour to follow, looking at practical methods of implementation. The Berlingen Declaration will be an item on the agenda of the 2002 Council meeting. It was also agreed that the President should ask the Applied Mathematics Committee to encourage nomination of a reasonable number of applied mathematicians as Council delegates.

Relations with Mathematical Institutions/Organisations

Peter Deuflhard reported that about 500 participants (including 42 speakers) had

Peter Deuflhard

registered for the Berlin *EMS-SIAM conference* in September 2001. The meeting consisted of 10 invited lectures, 151 talks, 37 mini-symposia and one Round Table, as well as posters. Benoit Mandelbrot would give a lecture by TV from the USA. Funding had been received from the EU, the German Science Fund and the EMS, and an application to UNESCO was still pending; the sponsors of the meeting also included Springer-Verlag. The moderator for the Round Table on Applied Mathematics would be Martin Grötschel. There was an interesting discussion on the possibility of future joint meetings with SIAM and other bodies.

Olli Martio had been elected as an EMS representative on the *Board of the Banach Centre for the Mathematical Sciences* for 2001-4. It was agreed to re-elect Marta Sanz-Sole to a second term (2002-5) and to elect Rolf Jeltsch to a first term on the Board (2002-5).

It was agreed that the EMS should become a member of CIMPA *(Centre International de Mathématiques Pures et Appliquées)*.

Stockholm European Congress of Mathematicians (4ECM) in 2004

The dates for the Congress will be 27 June - 2 July 2004. A *Letter of Understanding* between the Organising Committee and

Renzo Piccinni

the EMS was agreed, subject to minor modifications.

The composition of the *Organising Committee* of the 4ECM was agreed as: Ari Laptev (President), Anders Lindquist, Christer Kiselman, Torsten Ekedahl, Mikael Passare, Ulf Persson and Kjell-Ove Widman. A preliminary list of members of the *Scientific Committee* was also discussed; Lennart Carleson (Stockholm) will chair the committee, and the deputy chair will be Bjorn Engquist.

The Executive Committee discussed possible names to chair the *Prize Committee*. It was suggested that at least one member of the EMS Executive Committee should serve on the Prize Committee, to avoid problems developing. Nominations for prize-winners from the mathematical community would be sought. The point was made that nominees should not benefit from multiple nominations, in order to avoid influence from pressure groups; the only criterion that mattered should be the merit of the proposed person. Work was continuing on the guidelines for the Prize Committee; the 2002 meeting of the EMS Council will decide on the final guidelines. It was however agreed that the age limit for prize-winners should be 34 years, plus a further 3 years in the case of a broken career.

A preliminary budget for the 4ECM was discussed; this incorporated a reduced fee for early registration and a significant reduction for EMS individual members. It was agreed to approach UNESCO and member societies of the EMS for funds to support participation by Eastern European mathematicians.

In the run-up to the 4ECM, it was agreed to hold an Executive Committee meeting in Stockholm in September 2002.

European Congress of Mathematicians in 2008: Information for Possible Applicants

A call for outline bids for the 5ECM will be published on EMIS and in the EMS *Newsletter*, with a deadline of 31 December 2002; if there are at least two bids, fuller bids will be requested by 30 June 2003. In the summer of 2003 a site committee will be formed, to be followed by a recommendation to the Executive Committee in the autumn of 2003. The EMS Council will make the final decision in 2004, immediately before the 4ECM.

Membership matters

It was agreed to recommend to Council the raising of class of the *Israel Mathematical Union* from Class 2 to Class 3.

Society elections in 2002

The Executive Committee discussed possible names for its nomination for officer posts and Executive Committee membership for the period 2003-6.

EMS budgetary matters

It was agreed to propose to Council in 2002 that the *corporate fee* be raised from 340 to 360 euro.

Changes to the EMS Statutes and By-laws

Work had continued on possible changes to the Statutes and By-laws, to clarify and improve their operation. The Executive Committee discussed a draft, and agreed to look again at a revised draft in February 2002. It was agreed to propose to Council that academic institutions as institutional members should have a new fee category of x (Rule 25), and that other institutional members should continue to pay an annual fee of $3x$.

Bologna Declaration

Very little response had followed from the editorial on the Bologna declaration in the June *Newsletter* or from member societies. This surprised the Executive Committee!

Publications

The subscription price for the *Journal of the EMS* (JEMS) had remained constant until now, and needed to be reviewed. The Executive Committee accepted 210 euro as a basic price for the 2002 subscription to JEMS. The Publications Officer agreed to check with Springer on any additional subscriptions via the LINK scheme; and to urge Springer to include a credit card payment option on its subscription renewal form.

The distribution of the EMS *Newsletter* is around 2500 copies of each issue. The Executive Committee discussed the level of revenue from advertising in the *Newsletter*. The Society's General Purposes Committee had agreed to increase the *Newsletter*'s advertising rates from 1 January 2002 by around 6% over the figures that applied from 1999 to 2001, and to encourage more job advertisements in the *Newsletter*, as the cost to advertisers of around £100 is very cheap. The General Purposes Committee had also agreed to increase the 2001 commercial annual subscription price to libraries and departments of the *Newsletter* of 60 euro to 65 euro in 2002. Discussions would be held shortly in relation to reviewing the prices of inserted material in the *Newsletter* mailings.

The Publications Officer, Carles Casacuberta, tabled the list of EMS books in the Springer series:

- N. J. Cutland: *Loeb Measures in Practice: Recent Advances*, Lecture Notes in Math. **1751** (EMS Sub-series), Springer-Verlag, Berlin-Heidelberg, 2000 (1997 EMS Lectures)
- Diaz (ed.): *Mathematics and Environment* (2nd Diderot Mathematical Forum, 1997) plus a substantial list 'in preparation'.

Future meetings of the Executive Committee

The following indicative dates and locations for future meetings were agreed:

- Spring 2002 in Brussels (Belgium), on 9-10 February;
- Summer 2002 in Oslo (Norway), on 31 May 2002 (before the Council meeting);
- Autumn 2002 in Stockholm (Sweden).

David A. Brannan

A common sense tip

From time to time, active mathematicians receive invitations to submit papers to research journals or conferences, to have their name included as a member of a journal editorial board, to speak at a conference, to participate in a conference, to have their name included as a member of the organising committee of a conference, and so on. Sometimes these invitations include a request for payment of some sort (e.g. conference fees, page charges, or whatever).

The vast majority of such invitations are of course entirely genuine and welcome to the recipient! However, a small minority of such invitations represent money-making schemes of a type that might not be immediately obvious to the recipients, and that might not be at all welcome to them if they understood what was going on. The internet is often used for such invitations, just as it is for a number of other doubtful financial schemes.

If you receive an invitation to be involved in a journal or conference whose organiser's reputability you do not already know, it is wise to check out the integrity of what is proposed before agreeing to let your name be used and before sending any money.

David A. Brannan

EMS Council elections

The following nominations for the EMS Council were received by the deadline, 15 November. As there were fewer nominations than vacancies, the following four persons have been elected delegates of individual members for the years 2002-05.

Marina Marchisio Torino (Italy), *e-mail: marchisio@dm.unito.it*
Proposer: Alberto Conte; *seconder*: Giuseppe Anichini
Biography: I was born in Boves (Italy) on 20/12/1969. I studied at the University of Torino, where I got my Doctorate in Mathematics in March 1999 for a Thesis on *Unirational quartic hypersurfaces*, under the scientific supervision of Alberto Conte. Since July 1999 I have been a Researcher (Ricercatore) in the Faculty of Sciences of the University of Torino. My research field is algebraic geometry – in particular, rationality problems for higher-dimensional algebraic varieties. Since 1996 I have been acting as editorial secretary of the *Bollettino dell'Unione Matematica Italiana*. I have been a member of the Council of the European Mathematical Society for 1998-2001 as a representative of individual members.
Statement: If I am re-elected, I shall continue my action of the previous four years in favour of European Young Researchers, in order to get more jobs for them in the universities and research institutions.

Vitali Milman, Tel Aviv (Israel); *e-mail: milman@post.tau.ac.il*
Proposer: Dan Haran; *seconder*: Zeev Rudnick.
Biography: Professor at Tel-Aviv University, 1973-. Incumbent, Argentinia Chair in Mathematics, Tel-Aviv University. *Born*: 1939. *Education*: Ph.D. 1965, Institute for Low Temperature Physics, Kharkov; D.Sc. 1970, Institute for Low Temperature Physics, Kharkov. *Fields of specialisation*: Functional analysis; convexity; asymptotic geometric analysis. *Publications*: over 130 papers and 11 edited books. *Invited addresses*: ICM1986, Berkeley (analysis section); ICM1998, Berlin (analysis section); ECM1996, Budapest (plenary address); and over 150 colloquia and seminar lectures at major universities and talks at international conferences. Editor of *GAFA* (*Geometric Analysis and Functional Analysis*); member of Editorial Board of *Israel J. Math*. President, Israel Math. Union (2000-); Member, Board of Governors of Tel Aviv University (2001-); Member, Board of Directors, Weizmann Scientific Press of Israel (1983-92); Member, Board of Directors, Institute of Industrial Mathematics, Beer Sheva (1992-95).
Statement: I view the EMS as potentially the most important body representing and lobbying for mathematics in Europe. In the current era of a united Europe, scientific funding increasingly depends on the decisions of a supranational bureaucracy that is not easily accessible via national societies.

Maintaining and enlarging support for mathematics within Europe requires vigorous lobbying efforts on the part of a body that can speak clearly and forcefully for the European mathematical community as a whole. The only credible candidate for this important role is the EMS. It already proved its leadership, which I would like to see broadened and strengthened.

On the world level, I see the EMS as providing a useful and healthy balance to other groups within the International Mathematical Union which can serve to further the interests of European mathematics and mathematicians within that body.

Finally, as a professional society, the EMS must continue and expand its activities in organising European Math. Congresses, in support of joint European mathematical conferences, scientific exchange, and the easy movement of mathematicians between the countries of Europe.

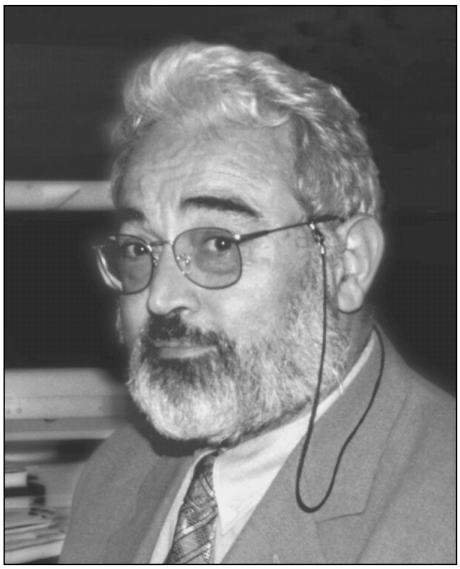
Robin Wilson, Milton Keynes (UK), *e-mail: r.j.wilson@open.ac.uk*

Proposer: David Brannan; *seconder*: Barbara Maenhaut.
Biography: I am a senior lecturer in the pure mathematics department of the Open University, UK, as well as being a Fellow of Keble College, Oxford University. I am currently Visiting Professor in the History of Mathematics at Gresham College, London, and have also held a number of visiting appointments in the USA.

My two main research areas are in graph theory/combinatorics and the history of mathematics, and I have written and edited about 25 books in these subjects, as well as a substantial number of research and expository papers. I am a great believer in the propagation and popularisation of mathematics, and try to achieve this through my books and in the 30-40 popular lectures I give each year to various audiences.

Over the past three years, I have been heavily involved with the activities of the European Mathematical Society, as Editor-in-Chief of the EMS *Newsletter*, as a frequent attender of Executive Committee meetings, and as an invited speaker at the fourth Diderot mathematical forum.
Statement: For the past three years I have been Editor-in-Chief of the EMS *Newsletter*, a role I hope to continue for some time to come. I am running for the EMS Council because I wish to become more closely involved with the activities of the Society, and because I believe that my knowledge of recent EMS events, acquired through working on the *Newsletter*, could be of value to the Council.

Sebastià Xambó-Descamps, Barcelona (Spain); *e-mail: sebastia.xambo@upc.es*



Proposer: Manuel Castellet; *seconder*: Carles Casacuberta
Biography: Full Professor of Information and Coding Theories at the Technological University of Catalonia (Universitat Politècnica de Catalunya) since 1993, and Vice-Rector of Information and Documentation Systems April 1998-March 2002.
My main research interests at present are in the applications of algebraic geometry to fields such as enumerative geometry, error-correcting codes, computational mathematics and mathematical physics. Recently I coordinated the development of WIRIS (TM), a multilingual, web-accessible system, to cover a wide range of computational mathematics needs (which has been installed by the Catalan Ministry of Education to meet the computational needs of students and teachers of primary and secondary schools and includes facilities for the production of digital teaching and learning materials).

Born in 1945, married with two

daughters, and first lecturer in the University of Barcelona since 1969, I spent the terms 1977-78 and 1978-79 at the University of Brandeis (Massachussetts, USA), where I learned algebraic geometry from Teruishi Matsusaka, David Eisenbud and Michael Harris. After receiving a Master of Arts in Mathematics in 1978, I obtained my PhD in Barcelona in 1991. I was associate professor of geometry and topology in the University of Barcelona 1982-89 and full professor of algebra in the Universidad Complutense of Madrid 1989-93.

Statement: President of the Catalan Mathematical Society, of the Institute of Catalan Studies, since February 1995 (and leaving office not later than December 2002); I was the president of the Executive and Organising Committees of the *3rd European Congress of Mathematics* in Barcelona, 10-14 July 2000. My motivation for such undertakings as these, stems from the desire to contribute in as an effective way as possible to the development of a really comprehensive European space for mathematics where everybody can deliver the best of themselves.

The full list of delegates of individual members for 2002-03 is as follows:

Giuseppe Anichini (1996-99-03), Dipto di Matematica Appl., G. Sansone, Via S. Marta 3, I-50139 Firenze, Italy

Vasile Berinde (2000-03), Department of Mathematics, Univ. of Baia Mare, Victoriei 76, RO-4800 Baia Mare, Romania

Giorgio Bolondi (1996-99-03), Dipartimento di Matematica-Politecnico, Piazza Leonardo 32, I-20133 Milano, Italy

Alberto Conte (2000-03), Corso Francia, 17, IT-10138 Torino, Italy

C. T. J. Dodson (2000-03), Department of Mathematics, UMIST, PO Box 88, Manchester M60 1QD, UK

Jean-Pierre Françoise (2000-03), Dept. Math., Univ. Paris 6, 4 Place Jussieu, Case 172, F-75252 Paris Cedex 05, France

Salvador S. Gomis (2000-03), Depto Analisis Matematico/Mat. Aplicada, Universidad de Alicante, Campus de San Vicente, ES-03080 Alicante, Spain

Laurent Guillopé (2000-03), Dép. Math., Fac. Sciences & Techniques, Université de Nantes, 2 rue de la Houssinière, BP 92208, F-44322 Nantes Cedex 03, France

Klaus Habetha (1996-99-03), Rektor, RWTH Aachen, D-52056 Aachen, Germany

Willi Jäger (2000-03), Inst. für Angewandte Math., Universität Heidelberg, Im Neuenheimer Feld 294, D-69120 Heidelberg, Germany

Tapani Kuusalo (1996-99-03), Department of Mathematics, University of Jyväskylä, P.O. Box 35 (MaD), FI-40351 Jyväskylä, Finland

Marina R. Marchisio (1998-01-05), Via Primula 20, I-12012 Boves (CN), Italy

László Márki (1996-99-03), Mathematical Institute, Hungarian Academy of Sciences, Pf. 127, H-1364 Budapest, Hungary

Vitali Milman (1998-01-05), School of Mathematics, Tel-Aviv University, Ramat-Aviv, Israel

Andrzej Pelczar (2000-03), Institute of Mathematics, Jagiellonian University, Reymonta 4, PL-30-059 Kraków, Poland

Zéev Rudnick (2000-03), School of Mathematical Sciences, Tel Aviv University, Ramat Aviv 69978, Israel

Gérard Tronel (2000-03), Labo d'Analyse Numer., Univ. P. et M. Curie, 4 pl. Jussieu, F-75252 Paris Cedex 05, France

Robin Wilson (2002-05), Department of Pure Mathematics, The Open University, Milton Keynes MK7 6AA, United Kingdom

Sebastià Xambó-Descamps (2002-05), Department of Mathematics Apl. II, Technical University of Catalonia, ES-08028 Barcelona, Spain

New EMS members

We welcome the following new individual members to the European Mathematical Society.

Australia
Urbas, John

Belgium
Bair, Jacques
Bellemans, J.
Borrey, Sabine
Botterman, Stefaan
De Maesschalck, P.
Dehaye, Paul Olivier
Devillers, Alice
Fiorini, Samuel
Geivaerts, Marcel
Kuijken, Elisabeth
Luyckx, Deirdre
Stulens, Koen
Mielants, Wim
Quarta, Lucas
Rigo, Michel
Roisin, Jean-Roger
Plastria, Frank
Sebille, Michel
Simar, Léopold
Stienon, Mathieu
Stulens, Koen
Teugels, Jef
Toint, Philippe
Van Camp, Ellen
Warrinnier, Alfred
Zhang, Yinhuo

Brazil
Barbosa, Rommel
Ferreira, Jorge

Canada
Fillmore, Peter
Lakhany, A.
Thomas, R. S. D.

Czech Republic
Ephremidze, Lasha

Croatia
Ivansic, Ivan

Denmark
Bennedsen, Helge
Booss, Bernhelm
Brons, Morten
Carstensen, Angela
Christiansen, Edmund
Claudius, Michael
Conradsen, Knud
Haugaard, Kristian
Hoffmann-Jorgensen, Jorgen
Hogsbro-Thygesen, Uffe
Kiming, Ian
Kjargaard Pedersen, Gert
Kjeldsen, Tinne
Lynggaard, Joergen
Madsen, Tom
Sinclair, Robert
Skovsmose, Ole
Sørensen, Michael
Thusgaard Ruhoff, Peder

France
Boivin, Daniel
Bodin, Antoine
Borrelli, Vincent
Cerf, Jean
Chavent, Guy
Chéniot, Denis
Cont, Rama
Coupet, Bernard
Duval, Yves
Elskens, Yves
Jambu, Michel
Mardin, Arif
Periaux, Jacques
Rhin, Georges
Roos, Guy
Timmel, Jean-Francois
Trotman, David
Ursat, Xavier
Vergne, Michele
Waldschmidt, Michel

Germany
Alefeld, Götz E.
Cleve, Ludger
Frommer, Andreas
Fuegenschuh, Armin
Haase, Peggy
Heinlein, Peter
Holzleitner, Ludwig
Hubski, Martha
Kawohl, Bernhard
Nakamura, Shu Gilbert
Smoczyk, Knut
Werner, Dirk

Greece
Dassios, George
Mavridis, N.
Vlamos, Panayiotis

Guatemala
Moreira Galicia, Manuel

Hong Kong
Hu, K. Y.

Ireland
Hutchinson, Kevin

Israel
Abarbanel, Saul
Adin, Ron
Agranovsky, Mark
Alesker, Semyon
Alkalai, Nurit
Amram, Meirav
Arad, Zvi
Beck, Jonathan
Bercovier, Michel
Berezina, Miriam
Besser, Amnon
Chillag, David
Cwikel, Michael
Dax, Achiya
Dula, Giora
Elin, Mark
Enden, Giora
Farber, Michael
Gelaki, Shlomo
Gilat, David
Gitik, Moti
Gohberg, Israel
Gordon, Yehoram
Haran, Dan
Horwitz, Lawrence Paul
Juhasz, Arye
Krasnov, Yakov
Kaminski, Jeremy Yermiyahu
Kaplan, Gil
Karp, Lavi
Kheifets, Alexander
Krushkal, Samuel
Lawrence, Ruth
Leborgne, Daniel
Leizarowitz, Arie
Lerer, Leonid (Arie)
Levy, Azriel
Levy, Eliahu
Margolis, Stuart W.
Megrelishvili, Jonathan
Merzbach, Eli
Moran, Gadi
Novick-Cohen, Amy
Olevskii, Alexander
Reisner, Shlomo
Roitman, Moshe
Rom-Kedar, Vered
Rosset, Shmuel
Schuss, Zeev
Sever, Michael
Shoikhet, David
Shustin, Eugenii
Shvartsman, Ludmila
Sodin, Mikhail
Srebro, Uri
Tkachenko, Vadim
Tsirelson, Boris
Weir, Yitzhak
Weiss, Benjamin

Italy
Balossini, Mario
Capalbo, Antonio
Casiraghi, Sergio
Cesarano, Clemente
Chiaretti, Mauro
Cichero, Anna
Cipollone, Roberto
Citrini, Claudio
Conti, David
Di Lorenzo, Emilia
Eschgfaeller, Josef
Fiorito, Giovanni
Furi, Massimo
Furnari, Giuseppe
Gaeta, G.
Gonella, Corrado
Gori, Franco
Machi, Antonio
Micelli, Giuseppe
Moscucci, Manuela
Paveri Fontana, Stefano
Pennisi, Mario
Pizzimenti, Pasquale Francesco
Puccio, Luigia
Rivara, Luigi
Romito, Marco
Ruf, Bernhard
Salvetti, Mario
Savare, Giuseppe
Sibillo, Marilena
Smit Ghinelli, Dina
Volcic, Aljosa
Zanchetta, Nadir

Luxembourg
Bausch, Raymond

Norway
Reichelt, Yngvar

Poland
Ciesielski, Krzysztof
Czerwinska-Lenkowska, Teresa
Pisarek, Jerzy
Radzikowska, Eugenia
Rogula, Dominik
Sztyren, Malgorzata

Portugal
Guerreiro, Antonio A.
Pereira, Antonio M. R.
Santos, Carlos A.

Romania
Radulescu, Vicentiu

Russia
Yagola, Anatoly

South Africa
Kalinde, Albert

South Korea
Kim, A. C.

Spain
Arias Cano, Cristina
Bonilla, Luis L.
Cal Casals, Fernando
Carro Rosell, Maria Jesus
Cerda i Martin, Joan
Cifuentes Muniz, Patricio
Curto Dias, Josep
Fernandez Garcia, Guillermo
Galindo Pastor, Carlos
Giraldo Carbajo, Antonio
Gomez Torrecillas, Jose
Hernandez Penalver, Gregorio
Lopez Gonzalez, Luis Maria
Martin del Rey, Angel
Martinez Pastor, Ana
Ojeda Aciego, Manuel
Ortega Titos, Miguel
Padron Fernandez, Edith
Pedregal Tercero, Pablo
Perez Riera, Mario
Pison Casares, Pilar
Richard, Philippe R.
Romance del Rio, Miguel
Sanchis Lopez, Manuel
Sastre Rosa, Maria Asuncion
Soria de Diego, Javier

Sweden
Andersson, Karl Gustav
de Gosson, M.
Essén, Matts
Hansson, Örjan
Passare, Mikael
Pefferly Jr, R. J.

Switzerland
Bissegger, Elena
Buchmann, Fabian Martin
Frauenfelder, Philipp
Imhof, Jean-Pierre
Iozzi, Alessandra
Ishikawa, Masaharu
Jainz, Michael
Joosten, Robert
Kuensch, Hans Rudolf
Loher, Damian
Matache, Ana-Maria
Motamen, Simin
Ortega, Juan Pablo
Reimann, H. M.
Savelieva, Marina
Schmidlin, Gregor
Struwe, M.
Todor, Radu-Alexandru
Torrilhon, Manuel
Toselli, Andrea
Troxler, Andreas
Wihler, Thomas
Zimmermann, Susanne

Turkey
Akinci, Karen

United Kingdom
Byott, Nigel
Deitmar, Anton
Gardiner, A. D.
Hasson, R.
Jarvis, T. M.
Keeling, H.
Lillington, John Newman
Pantilie, R.
Rubidge, N. W.
Stewart, J.
Wiltshire, Ronald
Wilson, P. L.
Wotherspoon, Craig Iain

United States
Edwards, Robert D.
Linnell, P. A.
Martens, Johan
Norton, Julia
Nworah, Kingsley I.
Saloff Coste, Laurent

Ukraine
Suvorov, Serghey G.

Uzbekistan
Aripov, Mersaid

European Congress of Mathematics

Call for Bids for the 5ECM

Outline bids from possible organisers of the 2008 Congress are now invited, and should reach the EMS Secretariat by 31 December 2002. The address of the Secretariat is Mrs Tuulikki Mäkeläinen, Department of Mathematics, University of Helsinki, P.O. Box 4, FI-00014 Helsinki, Finland (Tel: +358-9-1912-2883; Fax: +358-9-1912-3213; *e-mail*: tuulikki.makelainen@helsinki.fi).

The information below may be helpful to possible organisers. Informal discussions are welcomed, and may be addressed to the Secretary David Brannan (*e-mail*: d.a.brannan@open.ac.uk) or any other member of the Executive Committee.

General information on ECMs

European Congresses of Mathematics are organised every four years. The first Congress was held in Paris in 1992, the second in Budapest in 1996, and the third in Barcelona in 2000. In 2004 the Congress will be held in Stockholm. The next free slot for a Congress is the year 2008. The Congress must be in Europe.

Experience of previous Congresses suggests that the attendance might be expected to be around 1000 mathematicians. The duration has so far been 5 days. 10 EMS Prizes are awarded to young outstanding European mathematicians at the opening ceremony.

The Congress programme should aim to present various new aspects of pure and applied mathematics to a wide audience, to offer a forum for discussion of the relationship between mathematics and society in Europe, and to enhance cooperation among mathematicians from all European countries. The standard format of previous ECMs has been:

- about 10 plenary lectures;
- section lectures for a more specialised audience, normally with several held simultaneously;
- mini-symposia;
- film and mathematical software sessions;
- poster sessions;
- round tables.

An exhibition space for mathematical societies, booksellers, etc. is required. No official language is specified and no interpretation is needed.

The Proceedings of the previous ECMs have been published by Birkhäuser-Verlag.

Decision process for 5ECM

(i) Bids are invited via this notice in the EMS Newsletter in 2001, and via letters to the EMS member societies sent out in 2001 by the EMS Secretariat; the deadline for bids is 31 December 2002. These bids need only be outline bids giving a clear idea of the proposal and possible sources of financial and local support.

(ii) Early in 2003 the Executive Committee of the EMS ('EC') will consider the bids received. It will invite one or more of the bids to be set out in greater detail so that it can decide which bids are sufficiently serious options to be considered further. The deadline for such 'worked up' bids is 30 June 2003.

(iii) The EC will then create a short-list of sites that appear to offer the best possibilities for a successful Congress.

(iv) The EC will then appoint a Site Committee to visit the short-listed sites between July and December 2003 to check a range of items in connection with the development of the Congress. For example:
- Size and number of auditoriums; location and equipment
- Room for exhibitors
- Hotel rooms and dormitories; location, prices, number in different categories and transportation to lectures
- Restaurants close to Congress site, number and prices
- Accessibility and cost of travel from various parts of Europe
- Financing of the Congress; support to participants from less favoured countries, in particular
- Financing for the EMS Prizes
- Experience in organising large conferences
- Timing of the Congress
- Social events
- Plans to make publicity for Mathematics on the occasion of the Congress

(v) In 2004 the EC will make a recommendation for the site to the EMS Council on the basis of the bid documents and the Site Committee report. The Council will reach its decision prior to 4ECM in 2004.

Relations between the EC and the Organising Committee of 5ECM

After the Council decision, the local organisers will be asked to present a draft budget and an outline of the programme of the Congress. The actual Congress organisation is the responsibility of the local organisers.

At least two committees must be appointed - namely, the Scientific Committee and the Prize Committee. The Scientific Committee is charged with the responsibility for conceiving the scientific programme and selecting the speakers. The Prize Committee is charged with the responsibility of nominating the EMS Prizewinners.

For each of these committees the Chairs are suggested by the local organisers and agreed after consultation with the EC. In turn, the members of the committees are suggested by the Chairs, and are approved after consultation with the EC.

The local organisers are responsible for seeking financial support for the Congress and for the meetings of its committees. However the EMS commit to provide some financial support for the travel of Eastern European mathematicians to the ECM, and would also assist and advice in seeking sources of funds, in particular from the EU. The EMS and the local organisers should be partners in the effort to find funding support for the prizes.

The level of the registration fees is of great importance to the success of an ECM. The EC asks that it should be involved before a final decision on the level of fees is made; members of the EMS normally receive a reduction of some 20% on the registration fees.

The EC would wish to be informed of progress at its regular meetings. The EC would be pleased to offer advice to the local organisers on matters such as the scientific programme, budgetary developments, registration, accommodation, publications, web site, etc. Publicity for the ECM via the EMS *Newsletter* and the EMIS site is strongly recommended.

Marta Sanz-Solé and David Brannan

Pierre de Fermat (1601? - 1665)

His life beside mathematics

Klaus Barner

Fermat's outwardly uneventful life is soon told.
André Weil [13]

The 400th birthday of Pierre de Fermat, the great seventeenth-century French mathematician, was celebrated in 2001. However, this is probably based on a fallacy (see [2]): Fermat was probably born in 1607, or in the first days of January 1608, in Beaumont-de-Lomagne. He was the son of the rich wholesaler and manufacturer Dominique Fermat, and his mother, Claire De Long, his father's second wife, came from a noble family of jurists (see [11]). Thus, strictly speaking, the celebrations and conferences with respect to Fermat's 400th birthday are premature. But we won't spoil the fun - we'll join the celebrations of Fermat's birthday, and report on his little-known private and professional life.

In the second half of the fifteenth century, the Fermat family apparently emigrated from Catalonia to Beaumont-de-Lomagne, a fortified village with a market, about 55 kilometers to the north-west of Toulouse. There, in the sixteenth century, Pierre Fermat's grandfather Anthoine run an ironmongery that earned him a modest fortune which he bequeathed to his two sons Dominique (from his first marriage, Fermat's father) and Pierre (from his third marriage, Fermat's godfather). Both sons increased their father's inheritance to the best of their abilities. Dominique was particularly successful. A merchant who ran a leather wholesale trade with Italy, Spain and England, he also had a flourishing lime factory and gained considerable prosperity. He invested his profits in numerous farms and other plots of land, which he leased on the basis of *metayage* contracts.

Fermat Memorial with the sculpture by Falguière in front of the covered market of Beaumont

Through his marriage with a noblewoman, Claire de Long, reflecting his increased standing, he gained access for his sons Pierre and Clément to the *noblesse de robe*. His family's social promotion was planned well in advance: for, the only way to achieve it was to buy the office of a parliamentary councillor (*conseiller*) at one of the Supreme Courts of Justice (*cours de parlement*) in the French provinces, just as in Toulouse or Bordeaux. This custom, already disputed during the *Ancient Régime* but completely legal, had been introduced by the French Crown in the sixteenth century because of lack of money. The prerequisite for this was not only a respectable fortune. One had also to gain appropriate qualifications: three years of study of law, leading to a *baccalaureus (juris civilis)*, and four years of practical experience as a lawyer at one of the Supreme Courts. Further, a suitable office had to be up for sale, and the support of members of the particular parliament was needed, requiring substantial favouritism. At the end there would be an entrance examination in law which not everyone passed.

Pierre de Fermat spent his schooldays with the *Frères Mineurs Cordeliers* in his home town. These were Franciscans who had settled in Beaumont around 1515 and founded a demanding grammar school in which classical Greek was taught, in addition to Latin, Italian and Catalan. This was unusual for the time in a small place with only 3000 inhabitants. For Pierre, who left school in 1623 at the age of 16, his good command of classical languages was a crucial precondition for his study in Orléans.

His choice of this place for study was well founded. The town on the Loire had an old and famous faculty of civil law whose reputation far beyond France attracted students from all parts of Europe - above all from Scotland, the Netherlands and Switzerland, as well as from German countries where students of Lutheran denomination formed a high proportion. In the sixteenth century Orléans had made a name for itself as a stronghold of humanistic jurisprudence. In this, a critical-philological return to the classical origins and sources of Roman law (particularly Justinian) played a central part. A reliable mastery of Latin and classical Greek was indispensable for these studies, and the classical languages were especially cultivated by the faculty of the *artes liberales* of Orléans. A baccalaureate from Orléans undoubtedly gained a young jurist a considerable reputation.

Around August 1626, Pierre de Fermat passed his examinations in Orléans, and duly received his certificate for successfully

passing the examination of *baccalaureus juris civilis*. In the following month Dominique Fermat wrote his last will and testament. Giving a compensation to his younger son Clément, and fixing the dowries of his daughters Louise and Marie, he chose his elder son Pierre as sole heir.

Pierre Fermat proceeded to Bordeaux and was sworn in as a lawyer by the *Grand' Chambre of the parlement de Bordeaux* in October 1626. Being called to the Bar of one of the French provincial parliaments, he had to set up in practice as a lawyer, because this was by royal law a precondition for recognition as a *conseiller* by the Minister of Justice. After his natural choice of Orléans as a place of study, his selection of Bordeaux for practising as a lawyer was surprising; for many different reasons Toulouse was a more obvious choice. It is likely that Fermat's choice of Bordeaux is connected with his mathematical leanings.

In Bordeaux, there was a small circle of lovers of mathematics, of whom the names D'Espagnet, Philon and Prades are known from Fermat's correspondence; Étienne D'Espagnet, whose father had been first president of the parliament of Bordeaux and a friend of Viète, owned Viète's works which were very difficult to obtain at that time. Here Fermat, who was just 20, started his mathematical career. But who advised him to settle as a lawyer in Bordeaux? It was probably Jean Beaugrand, who cultivated scientific relations with the gentlemen in Bordeaux. Fermat may have made his acquaintance in August 1626 in Orléans. At any rate, it is significant that Beaugrand followed Fermat's mathematical career with particular interest, and he always proudly reported on Fermat's achievements during his journeys to Italy and elsewhere. Beaugrand obviously felt that he had 'discovered' Fermat.

When Dominique Fermat died on 20 June 1628, Pierre became a wealthy man, and had only another two years to spend as an *avocat* in Bordeaux. If the opportunity then arose for him to buy a *conseiller's* office (in Toulouse, preferably), the first stage of the family plan would be achieved. This opportunity arose at the end of 1630, during a severe plague epidemic that carried off numerous *conseillers au parlement* in Toulouse. On 29 December 1630, Fermat concluded an advance contract with Ysabeau de la Roche, widow of Pierre de Carrière, *conseiller au parlement de Toulouse and commissaire aux requêtes*, regarding the purchase of the deceased's office.

The purchase price of 43500 *livres*, with an initial payment of 3000 *livres* on taking up the office, represented a usual, but enormous, sum. A farmer could earn about 100 *livres* per year, a parish priest some 300 *livres*, and a busy *conseiller* up to 1500 *livres* on which he then had to pay tax. From an economic point of view such a purchase was a miserable deal, particularly since by royal law the *conseillers* were not allowed to carry on a trade or practise a craft; nearly all of them earned their living from their estates, which they leased. Fermat, who had inherited from his father six farms and numerous other pastures, gardens and vineyards, was no exception in this respect. Only very wealthy landowners could afford the luxury of purchasing an office of that kind. The 'profit' consisted of the advancement into the *noblesse de robe*, the social reputation and privileges that went with it, and the participation into political power.

After Fermat had asked for the king's consent and passed the prescribed entrance examination of the *parlement de Toulouse*, he was sworn into office by the *Grand' Chambre* on 14 May 1631. From this moment onward, he enjoyed all the rights and privileges of a *conseiller's office* - the income from his office, and the right to use

Two recent Fermat stamps

the title *éculier* and put *'de'* before his name.

The close chronological linking between Fermat's appointment as *conseiller au parlement* and his marriage with Louyse de Long, the daughter of Clément de Long, *conseiller au parlement de Toulouse*, is interesting. The marriage contract was concluded on 18 February 1631, and on 30 March, de Long paid his future son-in-law 2865 *livres* as a down payment on the promised dowry of 12000 *livres*. The church wedding took place on 1 June in the *Cathétrale St-Etienne* of Toulouse.

The de Longs, remote relatives of Fermat's mother, lived in Toulouse in the *rue Saint-Remesy*, and also possessed a house in Beaumont-de-Lomagne adjoining the premises of the Fermat family. In that house Clément de Long used to spend his parliamentary vacations. Pierre and Louyse must have known each other from childhood, and their marriage seems to have been settled by the families long ago, provided that Pierre made it to *conseiller au parlement*. Contemporaries praise the beauty, beguiling charm and charity of the young woman who bore Pierre five children, Clément-Samuel, Jean, Claire, Catherine and Louise.

The French provincial parliaments of the *Ancient Régime* were not parliaments by today's standards. The idea of separating the powers of legislature, executive and judiciary, which had been elaborated by John Locke and Charles de Montesquieu and politically realised much later, was still completely unknown in the seventeenth century. The *parlements* performed the tasks of law-making, administration and jurisdiction, so far as they had been transmitted to them by the Crown for the provinces administered by them.

The *parliament de Toulouse* was opened for the first time in 1303. From the start, its area of responsibility included the complete south-east of the kingdom. Following the Parisian model, it had a *Grand' Chambre*, the original chamber from which all other chambers developed for procedural reasons: the *chambre criminelle* (also known as *la Tournelle*) and two *chambres des enquêtes*. The *Tournelle* dealt in the final instance with all offenders threatened with corporal punishment, and no clergyman was allowed to be a member of it; this chamber regularly delighted the citizens of Toulouse with its public executions. Each year two *conseillers* were exchanged between the *Grand' Chambre* and *Tournelle*, so that they were considered as one chamber divided in two. In the two *chambres des enquêtes* civil actions were decided in writing in the final instance.

The chairman of the *Grand' Chambre* and head of the whole parliament was the *premier président*. He was the only magistrate who had not purchased his office, being appointed by the king. His deputies in the *Grand' Chambre* were the chairmen of the other chambers and the *présidents à mortier* (two or three per chamber) who had also bought their prestigious offices, at three times the price of the ordinary *conseillers*. They regularly led the sittings of their chambers in rotation.

An ordinary *conseiller*, as Fermat remained all his life, could also play a central role if he was appointed the *rapporteur* of a case by the chamber. Additional income came with a *rapporteur's* role in a court case, and a hardworking *rapporteur* could raise his income significantly. Fermat was one of the most hard-working *rapporteurs* of the parliament; for example, in a ten-week period in the *Tournelle* from November 1657 to January 1658, he wrote no fewer than 34 *rapports/arrêts*. Fermat drew up his first *arrêt* on 6 December 1632 in the *chambre des requêtes*, his first *rapport* in the *Grand' Chambre* on 9 December 1654, and his last *arrêt* in the *chambre de l'Edit* on 9 January 1665, three days before his death.

The four chambers mentioned above formed the proper *cour* of the *parlement de Toulouse*. *The chambre des requêtes* in which Fermat took up his office of *conseiller* and *commissaire* in 1631, did not belong to the proper *cour* of the *parlement* and was at the lower end of the parliament's hierarchy. Its members heard preliminary civil cases, leaving the final judgements to one of the *chambres des enquêtes*.

A *commissariat aux requêtes* was generally a position for a beginner, allowing him to

become acquainted with the practice of the parliament, but it gave no advancement. For this purpose, the *conseiller* had to sell his office in the *chambre des requêtes* and purchase an office in the proper *cour* of the parliament. Fermat duly gave up his *commissariat des requêtes* on 4 December 1637, and acquired an office in the *cour* of the deceased Pierre de Raynaldy. He was registered at the court of the parliament on 16 January 1638, and held this office until his death.

Coats of arms on one of Picharrot's towers. In the lower row are those of four consuls of Beaumont, elected for the year 1617. Third from left is the coat of arms of the Fermat family

During Fermat's time as a *commissaire aux requêtes* he made the acquaintance of his long-time friend Pierre de Carcavi, who in 1632 became his colleague at the *parlement de Toulouse*. Carcavi moved to Paris in 1636 and mediated for Fermat with Marin Mersenne and his Parisian circle. Fermat's long-standing correspondence with these gentlemen started a few days after Carcavi's arrival at Paris and lasted (with an interruption) until shortly before his death. Fermat's famous dispute with Descartes occurred at the time of his move from the *chambre des requêtes to the first chambre des enquêtes*.

The *chambre de l'Edit de Nantes* belonged to the *parlement de Toulouse*. This chamber was created in 1598 by Henri IV, with equal representation by members of the Reformed Church and the Roman Catholic Church, and had its seat from 1632 to 1670 in Castres, 75 kilometres to the east of Toulouse. In this chamber, all cases of conflict, and all criminal cases in which adherents of both religions were involved, were settled. It consisted of two presidents, one from each Church, as well as ten magistrates of each denomination. The judges, members of the Reformed Church, were local and had purchased their offices. Each year, eight of the Catholic judges were elected by the king from a list of twelve *conseillers au parlement de Toulouse* that had been compiled by the *Grand' Chambre*. On 29 May 1638, the *Grand' Chambre* nominated Fermat for the first time for the *chambre de l'Edit*, and Fermat was selected by the king on 16 July. He spent the session of 1638-9 with his family in Castres.

From 1646, Fermat's letters to his erudite collegues became sparse, and for several years his mathematical corrrespondence almost stopped completely. Why was this? Deteriorating mental ability? (Fermat was just forty years old.) Mersenne's death on 1 September 1648? (His place was soon taken over by Carcavi.) We have rather to look for reasons among the strains of Fermat's professional life; these were connected with social and political disturbances: peasants' revolts in the south of France arising from brutal methods of tax collections, the rebellion of the *Fronde* against Mazarin, and the war against Spain. At the beginning of the 1650s, the last great French plague epidemic broke out, followed by famine.

We are rightly used to seeing Fermat as the great mathematician and humanist scholar. But according to his conception of himself, he was first and foremost a judge. At the parliament of Toulouse he had a seat for life. Even though he could live off his possessions in Beaumont-de-Lomagne, he regarded his job as *conseiller au parlement de Toulouse* as his proper life's work, and his career in this institution was more important to him than his reputation as a mathematician. Only when his professional activities allowed him enough leisure, such as when parliament was not in session during the numerous religious festivals, could he devote himself to his hobby of mathematics.

Fermat spent the great parliamentary recesses in September and October *à la campagne* in Beaumont-de-Lomagne, where at harvest time he received his share of the yields from the leased farms, as agreed by contract. He gave advice on legal questions to the inhabitants of his home town, and regularly took part in the citizens' meetings - his name turns up in the minutes for many years - helping them with particularly difficult items on the agenda. The Fermat family also showed its close attachment to Beaumont with charity and donations and by becoming godparents on numerous occasions. Very often Fermat had less time there for his beloved 'geometry' than he had hoped.

The Huguenot stronghold Castres, seat of the *chambre de l'Edit de Nantes*, was a particularly strong attraction for Fermat. Again and again he tried, not always successfully, to be proposed by the *Grand' Chambre* for the delegation to Castres and to be confirmed by the king. Between 1632 and 1665, of the 45 *conseillers au parlement de Toulouse* delegated to Castres whose term was renewed by the king for a further year, seven were renewed twice, four three times, and only Fermat four times: in 1644-6, 1648-50, 1655-7 and 1663-5. But what attracted Fermat so strongly to this town on the banks of the river Agout?

Three reasons can be given. First, a certain sympathy for the Reformed Church, which can already be observed in his parents and grandparents. Secondly, Fermat's exceptional capability as a mediator between conflicting interests, inherited from his father Dominique, which could not show to better advantage than at a chamber where reconciliation between the representatives of the two religions had regularly to be sought. The third, and perhaps strongest, reason was the intellectual atmosphere of Castres which, while the seat of the *chambre de l'Edit*, saw a golden age of culture that it never achieved again, before or since. Historians of Toulouse lament the intellectual fall of that town in almost all areas of art and science at that time, particularly with regard to the university, but note as an exception and *gloire de Toulouse* the great scholar Pierre de Fermat.

In Castres, in 1648, the Protestant Academy was founded with 20 initial members who came exclusively from the Reformed Church. Most of these gentlemen were *conseillers* or *avocats* of the *chambre de l'Edit*. Among them were the poets Samuel Izarn, Hercule de Lacger and Jacques de Ranchin, the theologians Raymond Gaches and André Martel, the philosopher Pierre Bayle, the medic, chemist and philosopher Pierre Borel, the physicist and translator Pierre Saporta, and the historiographer Paul Pellisson, but no mathematician.

Bayle and Pellisson enjoyed national reputation, and Saporta and de Ranchin were Fermat's friends. The latter read poems of Pierre and Samuel Fermat at meetings of the Academy; to him Fermat dedicated his critical commentary on the work of the Greek historian Polyainos, thereby demonstrating a knowledge of Greek philology. In 1664 Fermat saw one of Polyainos's rare works printed, prepared by Saporta; it concerns a short text in which Fermat interprets a passage from a letter of Synesios of Kyrene. Time

and time again, Fermat felt drawn to Castres; his youngest daughter Louise was born there in 1645, and when Fermat died there in 1665 his younger son Jean was canon.

His strong interest in a delegation to Castres did not prevent Fermat from pressing ahead with his professional rise to the *Grand' Chambre*. By 1647 he was already the longest serving *conseiller* in the first *chambre des enquêtes* and he frequently took over the presidency when the *présidents à mortier* were both absent.

His move from the first *chambre des enquêtes* to the *Tournelle* coincided with the outbreak of the Toulouse plague epidemic of August 1652 to July 1653. About 4000 citizens died - about ten per cent of the town's population - and Fermat himself almost fell victim to the plague. In May 1653 the philosopher Bernard Medon, *conseiller au présidial de Toulouse* and a friend of Fermat, wrote to the Dutch writer Nicolas Heinsius the Elder of Fermat's death (*Fato functus est maximus Fermatius*), only to withdraw this news in his next letter: *Priori monueram te de morte Fermatii, vivit adhuc, nec desperatur de ejus salute, quamvis paulo ante conclamata*. Fermat was one of those who became ill with the bubonic plague and survived, but his health was weakened from this time onwards.

Soon after the outbreak of the plague Fermat progressed to the *Tournelle*, according to the principle of seniority, and from there a move to the *Grand' Chambre* was routine. In November 1654 he became a member of the highest chamber of the parliament, and on 9 December he read his first *rapport* there. In November 1655 he was back in Castres, but returned to Toulouse in November 1657, again to the *Tournelle*.

Throughout his life Fermat was a loyal servant of the Crown. Born during the regency of Henry IV, he was a fourteen-year-old boy when the young king Louis XIII spent the night of 24 November 1621 in his father Dominique's house in Beaumont-de-Lomagne, while on a journey from Toulouse to Lectoure. But Fermat's impression of his king did not remain unsullied. In 1632 he witnessed the arrival in Toulouse of Louis XIII, with Cardinal Richelieu and 5000 soldiers. The king forced the Toulouse *Grand' Chambre* and the *Tournelle* to condemn to death the popular and highly regarded Duke Henri II de Montmorency because of rebellion against the king. The awkward task of *rapporteur* in this case fell to the oldest *conseiller* of the *Tournelle*, Fermat's father-in-law Clément de Long, in whose house Fermat lived at that time with his wife Louyse.

A stereotype that goes back to Mahoney (see [7, 8]), and has been adopted by more recent authors, is that Fermat was a mediocre *conseiller* and judge who tried to avoid all social, political and religious conflicts. Nothing is further from the truth. Fermat was no jurist who composed legal treatises, but was an outstanding practitioner who, tolerant of religious differences, stood up for justice and humanity without shrinking from confrontations with the mighty, such as the first president Gaspard de Fieubet.

In 1648 and 1651 Fermat committed himself to a rather hopeless fight against

Epitaph from the former Fermat-mausoleum in the monastary of the Augustins, Toulouse. Year of creation: 1665

the illegal and brutal methods with which the tax collectors (*partisans*) recovered the *taille* from the farmers. On this occasion Fermat uncovered the partisans' deceitful practice of backdating the tax receipts, thereby withholding for themselves revenues that were due to the king. In 1651, at the time of the *Fronde*, he was a member of the delegation for the parliament of Toulouse which successfully demanded (after negotiation for several months) that the delegates of the Estates of Languedoc (who took the side of the *Fronde*) should return to a legal state of affairs loyal to the king. And on 30 July 1652, through a courageous visit to the camp of the royal army, he prevented his home town of Beaumont-de-Lomagne (which had been plundered by the soldiers of the *Fronde*) from being taken by storm and completely destroyed by the king's soldiers. After the defeat of the *Fronde*, Fermat achieved through tough negotiation the outcome that Beaumont should receive reparation payments of 16266 *livres*. In 1654 Fermat put through the *Grand' Chambre* a fairer distribution of the income from the charges between the *Tournelle* and the *Grand' Chambre*; in this way, Fermat made himself unpopular with the clerics in the *Grand' Chambre*.

Another stereotype is the claim that Fermat never ventured farther than Bordeaux (see [13, p.39]). As we have already seen, he studied law in Orléans from 1623 to 1626. He may also have visited Paris as a student. Certainly, his duties as a *conseiller* forced him to undertake longer journeys; for example, in November 1646 the *Grand' Chambre* banned the dyers of Nîmes from buying high-quality indigo from the Middle East instead of the woad produced around Toulouse. When the dyers disobeyed the ban, Fermat was sent to Nîmes, about 300 kilometers to the east of Toulouse, to present the parliament's decision and confiscate the forbidden dye-stuff. This wasn't a pleasant task for a 'gentle, retiring, even shy man' ([7, Vol. 1, p.22]). Frequently Fermat was assigned to a small group of *conseillers* who travelled far to meet bishops, ministers and other dignitaries, or escorted them a long distance when they had taken their leave of Toulouse. In such cases Fermat's reputation as a scholar and good conversationalist was the reason for his selection.

Certainly Fermat was political, but he lacked two important qualities: unscrupulousness and ambition for power. But his abilities as a jurist have also been doubted by Mahoney (see [7, Vol. 2, p.20]) who wrote: 'The most candid appraisal of Fermat's abilities as a jurist, and one that runs counter to the usual adulation, comes from a secret report of Claude Bezins de Bésons, *intendant* of Languedoc, to Minister Colbert in 1663. Speaking of the *conseillers* and their relations to the suspect First President, Gaspar de Fieubet, Bezin said of Fermat: "Fermat, a man of great erudition, has contact with men of learning everywhere. But he is rather preoccupied; he does not report cases well and is confused. He is not among the friends of the First President".' Mahoney then drew negative conclusions with regard to Fermat's judicial qualities that have since been adopted without question by other authors. If he had investigated more carefully, such incorrect judgements would not have occurred to him.

In 1965, the legal historian Henri Gilles of Toulouse showed, in a careful investigation which Mahoney obviously did not read, that Fermat always cultivated a very clear style and that the language of his *arrêts* and reports stands comparison with the style of those written by his colleagues (see [6]). I have convinced myself that Gilles is right. A disparaging judgement by the *intendant* Claude Bazins de Bessons is easily explained: in September 1663 the minister Jean-Baptiste Colbert demanded from the *intendants* individual judgements of all *conseillers* and other royal officials at the parliaments. The *intendants* complied with this request so reluctantly that Colbert

asked some *intendants* for greater thoroughness. Had Mahoney read the whole report of 24 December 1663, and not only an isolated citation in the accompanying text for an exhibition catalogue (see [3, p.33]), he would have realised how superficial the judgements turned out to be (see [5, p.111ff]).

The house where Fermat was born. Its present shape was given to the property in the 18th century. In the background at the top is a 15th-century tower that belongs to the premises.

De Bessons resided in Montpellier and had to travel to Toulouse to make investigations and write his report. There he first informed himself about the *conseillers*. By that time Fermat was not in Toulouse, but rather in Beaumont or Castres. Therefore de Bessons, turned on behalf of Fermat to the king's man, the first president Fieubet, Fermat's enemy. That no fair judgement resulted is not surprising.

Much more interesting is the reason for the aversion between Fermat and Fieubet. The judicial murder of a priest, Jean Montralon, was stage-managed by Fieubet on 26 January 1658 (see [1]). This case had a Jansenist background, and Fermat was involved in it as *rapporteur* and examining judge. Montralon, of whose proved innocence Fermat was convinced, was hanged next day and his body was burned. Fermat was so incensed and shocked that he could not work as a judge for a month. On 6 February 1658, Sir Kenelm Digby, a notorious liar, reported on this case to John Wallis in Oxford, but in form of a wicked slander: that it was Fermat who condemned the priest to be burned alive (see [12, p.808f] and [8, p.360]).

Perhaps because of this event, or because of his visibly deteriorating health, Fermat seems to have thought about relinquishing his office of *Conseiller* in the *Grand' Chambre*. In a letter of 25 July 1660 to the ailing Pascal, he proposed that the two men should meet half-way between Clermont-Ferrand and Toulouse because his health was hardly better than Pascal's [10, Vol. II, p.450]). If the latter expected Fermat to travel the whole distance of 300 kilometres, then Pascal would run the risk *de me voir chez vous et d'y avoir deux malades en même temps*.

On 4 March 1660, Fermat wrote his last will and testament, with his elder son Samuel as his sole heir. He amplified this testament on 13 September 1664, in a codicil in which he made settlements in favour of his wife Louyse: Samuel was to pay his mother 32000 *livres* from the inheritance, an imposing sum which she could make good use of. Louyse outlived her husband by more than 25 years. In the preamble of this codicil Fermat speaks rather openly of his coming end ([4, p.347]): *Je soubsigné éstam incommodé d'une maladie qui pourroit avoir de mauvaises suittes.* In October 1664 Fermat set off for Castres for the last time, and died there on 12 January 1665 aged 57 years, after receiving the holy sacraments and with an alertness of mind to the end. On the next day he was laid to rest in the chapel of the Jacobins in Castres.

The date of Fermat's birth is disputed, and there is also confusion about where his mortal remains found their last resting place. Is it the chapel of the Jacobins in Castres which was demolished soon after Fermat's decease? Or is it the family mausoleum in the church of the Augustins in Toulouse, to which Samuel and Jean Fermat had their father's body moved? After examining all arguments (see [10, 4]) I believe that Fermat's body was transferred to Toulouse in the year of his death. But there is no proof. The family mausoleum was destroyed during the French Revolution and only Fermat's epitaph, currently restored, has survived.

References

1. K. Barner, Eine traurige Episode im Leben Fermats, *Mathematische Schriften Kassel*, Preprint No.21/00.
2. K. Barner, How old did Fermat become? NTM, *International Journal for History and Ethics of Natural Sciences*, Technology and Medicine (New series) 8 (4) (October 2001).
3. H. Blaquière & M. Caillet (eds.), *Un mathématicien de génie: Pierre de Fermat 1601-1665*, Catalogue de l'exposition organisée par la Bibliothèque Municipale de Toulouse, Lycée Pierre-de-Fermat, Toulouse, 1957.
4. P. Chabbert, Fermat à Castres, *Revue d'Histoire des Sciences* 20 (1967), 337-48.
5. G.B. Depping, Correspondance administrative sous le règne de Louis XIV, tome II, Imp. Nationale, Paris, 1851.
6. H. Gilles, Fermat magistrat. Pierre de Fermat, Toulouse et sa région, *Actes du XXIe congrès d'études régionales tenu à Toulouse les 15 et 16 mai 1965*, Fédération des Sociétés Académiques et Savantes de Languedoc-Pyrénées-Gascogne, Toulouse, 1966, 35-53.
7. M.S. Mahoney, *The Mathematical Career of Pierre de Fermat (1601-1665)*, 2 vols., Princeton University Press, 1973, 1974.
8. R. Rashed, C. Houzel & G. Christol (eds.), Oeuvres de Pierre Fermat, Vol. I, La théorie des nombres, Albert Blanchard, Paris, 1999.
9. P. Salies, Sur quelques points d'histoire toulousaine, *Mémoires de l'Academie des Sciences*, Inscriptions et Belles-Lettres de Toulouse, 14ème série, 1 (1960), 181-99.
10. P. Tannery, Paul & C. Henry (eds.), Oeuvres complètes de Fermat, Vols. I-IV, Gauthier-Villars, Paris, 1891-1912.
11. L. Taupiac, Fermat: sa vie privée avec pièces justificatives, *Bulletin de la Société Archéologique de Tarn et Garonne* 1879, Forestié, Montauban, 1880.
12. J. Wallis, *Commercium Epistolicum, Opera Mathematica II*, 757-860, Oxford, 1693.
13. A. Weil, *Number Theory, An approach through history, From Hammurapi to Legendre*, Birkhäuser, Boston, 1983.

Fachbereich Mathematik-Informatik,
Universität Kassel, D-34109 Kassel, Germany
e-mail: klaus@mathematik.uni-kassel.de

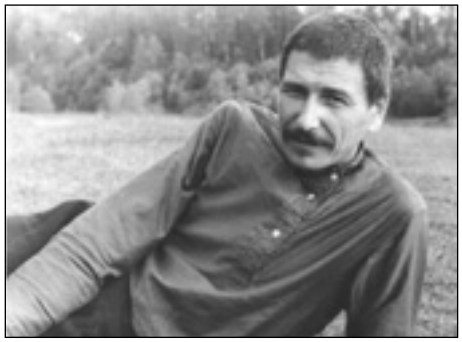
Interview with Sergey P. Novikov

Interviewer: Victor M. Buchstaber (Moscow)

Since 1996 Professor Novikov has been a Distinguished University Professor in the University of Maryland-College Park, USA. He also keeps strong ties with Russia, occupying part-time positions in Moscow; he is a principal researcher in the Landau Institute for Theoretical Physics and Head of the Geometry and Topology groups in the Steklov Mathematical Institute and in MSU.
Novikov is a Fields Medallist (1970). The Soviet Authorities did not allow him to attend the awards ceremony in Nice as a punishment for the letters he wrote supporting people who were arrested and sent to mental hospitals. Novikov is a member of several academies, including the Russian Academy, the US National Academy and other European academies. He is an honorary member of the London Mathematical Society, and Doctor honoris causa of the Universities of Athens and Tel Aviv. His works were rewarded through several prizes in the former USSR. During the period 1985-96, he was President of the Moscow Mathematical Society, succeeding A. N. Kolmogorov
This interview is in two parts – the second part will appear in the March 2002 issue.

What role did your famous family of Novikovs and Keldyshs play in your becoming a scientist?

My family played a great role. My father, Petr Sergeevich Novikov, was a famous mathematician. All mathematicians know his work on the theory of algorithms and combinatorial group theory, including the insolubility of the word problem and the solution of the Burnside problem for torsion groups. In the 1930s he was one of the best experts in the so-called



S.P. Novikov's father P.S. Novikov in 1947

'descriptive set theory' and in the 1940s in mathematical logic. He also started in the 1930s a new branch of mathematical physics: the reconstruction of a homogeneous bounded domain from its gravitational potential at infinity. My mother, Lyudmila Vsevolodovna Keldysh, was also a prominent mathematician – a full professor, and an expert in set theory and geometric topology.

The family had five children, and I was the third of them, the youngest of the three sons. All the sons became physicists and mathematicians, while the daughters chose other professions. My elder brother, Leonid Keldysh, is one of the internationally known theorists in solid-

S.P. Novikov's mother L.V. Keldysh with P.S. Alexandrov

state physics and in condensed matter physics. My other brother, Andrei Novikov, was an expert in algebraic number theory, but unfortunately died prematurely.

Additionally my mother's brother, Mstislav Keldysh, was a very talented mathematician in the theory of functions of a complex variable and in differential equations. An especially fundamental contribution was made by him to applied branches of aerodynamics. He was a well-known person in Soviet society, the chief theorist-adviser of the government and an organiser of computational work related to jets and space between 1940 and 1960. All information on the work of such people was officially restricted and not reflected in the world press. For a long time he was President of the Academy of Sciences of the USSR. My mother's father, Vsevolod Keldysh, was one of the leading building engineers in the USSR; he was mentioned in Nikita Khrushchev's memoirs.

By the way, Natalia Brusilova, the mother of Vsevolod Keldysh (my great-grandmother), was an aunt of the famous Russian general who defeated the Austrians during the First World War (the Brusilov breakthrough, 1916). The dodgy Bolshevik leaders Lenin and Trotsky used his military talents in their General Staff during the civil war.

Among the close friends of my parents were leading Soviet physicists and mathematicians of their generation: I. Tamm, a Nobel prizewinner and teacher of A. Sakharov, M. Leontovich and A. Andronov, applied physicists who played an important role in the country and who were known in the Soviet physical and mathematical community as carriers of honour.

Aleksei Andreevich Lyapunov, a pupil of my father, a well-known mathematician and a distant relative of an even more famous mathematician, organised a DNO (a children's scientific society), where his children, my brother Andrei and I, Vladimir (Dima) Arnold and other children in our family's circle, became acquainted with the elements of science. A. Lyapunov especially took a great interest in some branches of biology that were prohibited at that time.

Traditionally, high school students with a talent for mathematics participated in university circles and in Olympiads. I was successful in Olympiads at ages 13 and 14 and decided that I could probably become a mathematician. However, I had no calling for mathematics and so postponed my choice of profession until university. I decided to wait to see whether some other profession would attract me. It seemed to me that our family already had a lot of mathematicians.

I did not choose mathematics as my profession until I was 17, and I entered the Mathematics Division of the Moscow State University (MGU), the Department of Mechanics and Mathematics.

There are many legends about the famous MGU Department of Mechanics and Mathematics in the 1950s and 1960. Could you elaborate on the story, please?

I learned from my family that one could grow into a scientist at voluntary educational seminars by solving non-standard problems and studying things missed from the obligatory programmes.

I began to visit such a seminar during my first year. It was supervised by V. Uspenskii, a pupil of A. N. Kolmogorov in mathematical logic, who was at that time a young employee at MSU. At this seminar we studied the complete cycle of elementary problems in set theory, the foundations of the theory of functions of a real variable, and the algebra of logic. Soon Sasha (Alexander) Olevskii, my fellow participant at the seminar, became well known for his papers on the theory of functions of a real variable.

During my second year, when I was 18, I had to choose a research supervisor for the first time and work with him for a year. Only after that, in the third year, was a student finally allowed to choose his specialisation. This rule was in use during Kolmogorov's Deanship of the Department of Mechanics and Mathematics.

Unlike many of my friends, I chose algebraic topology. I was probably attracted by an announcement concerning

a seminar by M. Postnikov, V. Boltyanskii, and A. Shvarts. This announcement aroused the petulance of P. Aleksandrov, the chief Moscow topologist, because set-theoretic topology was placed in an unfavourable light.

In this seminar I began by choosing M. Postnikov as my research supervisor and attended the brilliant lectures of A. Shvarts, then a postgraduate, in which the modern achievements of topology were presented following the perfectly written works of J.-P. Serre.

During the second and third years I mastered a large collection of modern topological ideas, with a group of friends that included D. Anosov. When I began my fourth year, my research supervisor M. Postnikov left Moscow for China for almost the entire academic year, and A. Shvarts did not get work at MSU as a punishment for the above announcement. We organised a seminar without research supervisors: D. Anosov, D. Fuks, G. Tyurina and A. Vinogradov were among the participants. In that year (1958-59) I completed my first scientific research.

Tell us about the atmosphere at the Department of Mechanics and Mathematics at that time and on its formative influence on you as a scientist.

At the Department of Mechanics and Mathematics there was a creative spirit, and an anxiety on the part of the students to start scientific activity as soon as possible.

Completing my third year at the age of 20, I encountered the following situation at the Department of Mechanics and Mathematics: those who had chosen areas related to the theory of functions of a real variable were already authors of well-known scientific works. Some of them, members of the Kolmogorov seminar, had even written famous works.

In algebraic topology the situation was quite different: Moscow was not then at the centre of this area. Especially after the departure of Shvarts, I had to find my way to science without help from research supervisors.

How were your first works written? Among them was the well-known Milnor-Novikov theorem on the complex cobordism ring.

How does one begin? The most difficult task is to produce one's first scientific work, especially if one has no supervisor such as Kolmogorov who can quickly introduce one to the very centre of mathematics and indicate problems that are both deep and accessible.

My approach to this problem was as follows: one must take some new outstanding work that has not yet been studied in detail by the community and try with great effort to study it in depth. If you are successful, then you will be at home with methods almost all the experts in your area are out of touch with. In this case you will soon succeed in doing something new. This I did, by studying the remarkable works of Frank Adams and Rene Thom in 1958.

Bizarre homological calculations with special Hopf algebras formed a quite remarkable area that was then absolutely unknown, outside a narrow circle of algebraic topologists. Many years later, when the importance of Hopf algebras became known to everyone, people even forgot who first discovered these objects: it was actually Armand Borel (rather than Hopf) in 1954, but for a rather narrower purpose, the homology of Lie groups and H-spaces.

Hopf algebras of a new 'Steenrod' type were discovered by John Milnor in 1957. In Adams' works, they began to give deep results for the problem of Hopf invariants. I was the first (as well as J. Milnor) to apply this technique in cobordism theory, extremely successfully. At that time, in topology, refined algebraic manipulations became tightly mixed up with the geometry of function spaces, involving the theory of manifolds and using fundamental ideas of transversality, cobordism and the calculus of variations.

My first works were published in 1959-60 and became well known. The techniques of Hopf algebras and new homological constructions were applied to the calculation of homotopy groups of spheres and of cobordism groups. The most significant results were my theorems on the evaluation of cobordism rings, and the very ideas of cobordism were greatly extended.

By 1960, after all this work, I began to feel like a mature scientist and decided to turn my efforts to a new area, differential topology.

I well remember the great impression produced by your report at the 1966 International Congress of Mathematicians in Moscow. It was related to your earliest work, and the Adams-Novikov Spectral Sequence and Landweber-Novikov algebras had developed from your first interests.

Yes. Some years after I returned to this topic, in 1966-68, I reconsidered the methods of algebraic topology from the viewpoint of the theory of complex cobordism. The interaction of homological algebra with the geometry of manifolds adds a special elegance to this area. In particular, in collaboration with my student A. Mishchenko, in 1967 we began to apply formal groups in topology. This idea was soon picked up by D. Quillen (1969), who made an important contribution. In collaboration with my student, V. Buchstaber, we introduced the idea of a multi-valued formal group (1971). Later, the theory of these objects and their topological applications were considerably developed by V. Buchstaber. In collaboration with my students V. Buchstaber, S. Gusein-Zade and I. Krichever, we started another investigation in which formal groups were intensively used to study finite and compact transformation groups; this gave an alternative approach to the Atiyah-Bott-Hirzebruch analytic methods. These researches were decades ahead of their time.

However, as is well-known, you also returned to this topic later?

Yes. In the last decade you and I have had occasion to return to this area in connection with the theory of quantum groups and other algebraic problems. The store of algebraic ideas originating from complex cobordism theory is still far from exhausted.

Let's return to the Department of Mechanics and Mathematics in the early 1960s.

Having completed my first work I became actively interested in what was happening around me in the Department of Mechanics and Mathematics, and outside topology. Dima Anosov drew my attention to the geometry and topology of dynamical systems, and I began to study this area. In the late 1950s, I. Gelfand suggested that S. Dynin should consult me about algebraic topology in connection with the index problem for elliptic operators, and this helped him to produce good results for which he was awarded the prize of the Moscow Mathematical Society. The index problem was already becoming fashionable, and so I began to master partial differential equations and functional analysis with the help of my friends, especially Boris Mityagin.

S.P. Novikov with some of his students in Edinburgh in 1998: from left B. Dubrovin, P. Akhmetev, V. Buchstaber, S.P. Novikov, S. Tsarev, A. Veselov, I. Krichever, O. Mokhov, I. Taimanov. James Clerk Maxwell is lurking in the background.

In 1962 the famous work of Atiyah and Singer appeared, which increased the public's interest in topology. Smale's discoveries in 1961 significantly increased the role of topology in explaining

S.P. Novikov in 1974

complicated dynamical systems, and the works of Grothendieck, Hirzebruch, Atiyah and Milnor brought topology and algebraic geometry together.

After this, I began to study different areas of mathematics, actively attending seminars by I. Gelfand, V. Arnold, I. Shafarevich, M. Vishik and others. In turn, they asked me for help with modern topology.

This was precisely the atmosphere of the Department of Mechanics and Mathematics at that time, to help each other to master new ideas and the methods of different areas in the simplest and best way, and to explain ideas to one another transparently, without artificial complexities.

At that time, the Department of Mechanics and Mathematics of MSU represented all branches of pure and applied mathematics. I do not know of any similar scientific group assembled anywhere in the West after the Second World War.

What about your results on the classification of manifolds? What is Browder-Novikov theory?

I was greatly impressed by Milnor's remarkable discovery of smooth structures on the 7-dimensional sphere, together with the classification theory of manifolds that are homotopy spheres. During the academic year 1960-61 I studied the writings of Whitney, Pontryagin, Thom and Milnor, all of which are written with great clarity. The completeness of the proofs in these papers was achieved with no detriment to understanding and without any artificial formalisation.

In the summer of 1961 I met the 'stars' of world topology: Milnor, Hirzebruch and Smale, who came to the USSR for various conferences as the iron curtain gradually began to rise. These meetings were of great importance for me since they showed me the frontiers of differential topology. After my meeting with Smale at the Steklov Mathematical Institute, where I was a postgraduate, my local superiors began to regard me as a serious scientist.

Very soon, in the autumn of 1961, I managed to make a decisive breakthrough in the classification problem for simply connected manifolds with dimension greater than 5. This result was acknowledged as the best mathematical work in the Academy of Sciences of the USSR for that year.

Specifying the homotopy invariants of a simply connected manifold and the integrals of the Pontryagin classes over the cycles, you can determine the manifold uniquely up to finitely many possibilities. The description of this finite set is rather delicate, and I shall not dwell on it here: the set can be completely evaluated in terms of homotopy groups of the Thom space of the normal bundle describing special cobordisms of normal maps of manifolds of degree 1. These maps are analogous to the birational smooth maps in algebraic geometry. They have a remarkable topological property, which is the basis of the method. This technique was discovered independently by Browder in 1962 while solving another problem.

The evaluations in concrete examples led me to interesting conclusions. For instance, it follows from one of these calculations that the group of diffeomorphisms of the 8-dimensional sphere (to be more exact, the connected component of this group) cannot be contracted to the orthogonal subgroup. The PL-classification of manifolds also follows from these methods. As far as continuous homeomorphisms are concerned, the problem must be discussed separately.

We now come to your famous theorem on the topological invariance of Pontryagin classes and to the Novikov conjecture on higher signatures.

Continuous homeomorphisms differ substantially from smooth and piecewise-linear ones. For instance, the property of a map to be a diffeomorphism is stable in the C^1 topology: any map that is sufficiently C^1-close to a diffeomorphism is also a diffeomorphism. This is not true for continuous homeomorphisms of manifolds: perturbing a homeomorphism in the C^0 topology, one can obtain something very complicated but homotopic to the identity map.

While establishing the topological invariance of various quantities (homology and cohomology, Stiefel-Whitney classes, etc.), the methods of classical algebraic topology led to a stronger theorem, that these quantities are in fact homotopy invariants. This property is stable.

For simply connected manifolds, the integrals of Pontryagin classes over the cycles are certainly not homotopy invariant. For this reason, the problem of their topological invariance (with respect to continuous homeomorphisms of manifolds) occupied a special place in topology. Incidentally, as Milnor-Kervaire showed in 1962, the complete Pontryagin class regarded as an integral cohomology class is not invariant under PL-homeomorphisms. The topological invariance is established only for the integrals of these classes over those cycles that can be expressed via a Riemannian metric.

I managed to prove this conjecture in 1965 by using a sophisticated technique based on all the achievements of algebraic and differential topology. The idea consisted of a construction that is, in a sense, similar to the so-called étale topology of Grothendieck. Working with simply connected manifolds, I artificially introduced toric neighbourhoods of cycles and constructed differential topology in their coverings. Notably, in subsequent works (by Kirby and others) where other known problems in topology of continuous homeomorphisms were solved, the presence of toric constructions was obligatory. Thus, all integrals of Pontryagin classes over cycles turn out to be topologically invariant.

As a rule, they are not homotopy invariant. For simply connected manifolds there is only one homotopy invariant expression in Pontryagin classes, namely the Hirzebruch formula for the so-called 'signature' of the manifold – the important homotopy invariant characteristic of cobordism discovered in the early 50's by R.Thom and V.Rokhlin.. Its importance in topology, in algebraic geometry, and in the index theory of elliptic operators is well known. I observed that, if the fundamental group is non-trivial, then there are non-trivial cohomology classes with the following property: if we multiply this class by the Pontryagin-Hirzebruch polynomial and integrate over the entire manifold, then the result is homotopy invariant; for example, products of one-dimensional cohomology classes have this property.

In the course of my proof of topological invariance of the Pontryagin classes, I needed to establish some special cases of the above statement. Around 1967 my conjecture concerning products of one-dimensional cohomology classes was completely proved by a number of authors (V. Rokhlin, G. Kasparov, W-C. Hsiang and T. Farrell). In 1970 I formulated the general conjecture, that this property holds for any Eilenberg-MacLane cocycle that sits on the fundamental group – that is, it arises from homological algebra. The corresponding integral (over the entire manifold) of the product of this class with the Pontryagin-Hirzebruch class is referred to as a higher signature. My conjecture also includes the hypothesis that the higher signatures exhaust all homotopically invariant expressions of the curvature tensor.

For the past 30 years, this conjecture has been studied in many works in which homological algebra has become mixed with the theory of infinite-dimensional representations and functional analysis.

The conjecture has been proved for hyperbolic groups, for discrete subgroups of Lie groups, and in some other special cases.

In the late 1960's and the early 1970's, I developed ideas for a special algebraic analogue of symplectic geometry (which I called a Hamiltonian formalism over rings with involution); I thought that the explanation of higher signatures and of other deep properties of multiply connected manifolds had a symplectic origin. However, research by topologists into the problem of higher signatures used a different approach.

In 1971 I. Gelfand went into my algebraic ideas: they impressed him greatly. In particular, he told me of his observation that the so-called von Neumann theory of self-adjoint extensions of symmetric operators is simply the choice of a Lagrangian subspace in a Hilbert space with symplectic structure. Many years later, in 1997, I used this idea in my work involving scattering theory on graphs.

Did you work in the topology of low-dimensional manifolds? Is it true that your classical theorem on the theory of foliations is purely topological?

In 1963, under the influence of friends working in dynamical systems (especially V. Arnold), I developed the qualitative theory of codimension-1 foliations on manifolds, and managed to find deep results for two-dimensional foliations of three-dimensional manifolds. In particular, I proved the well-known conjecture that every non-singular foliation of the three-dimensional sphere S^3 has a compact leaf; in fact, I proved that a foliation on S^3 always contains a tube – that is, a two-dimensional torus filled with a special Reeb foliation. The complete set of these Reeb components is necessarily knotted. We still do not know which knots (linkages) can serve as a complete set of Reeb components of a non-singular foliation on S^3.

I gave a topological classification of analytic foliations in the solid torus in terms of tree-like sequences of conjugacy classes in braid groups. Using braids, Zieschang and I showed in 1963 that a non-singular foliation exists on any three-dimensional manifold. I also managed to find the first non-trivial topological condition on a three-dimensional manifold admitting an Anosov system with continuous or discrete time; for example, for discrete time the manifold must be homeomorphic to a 3-torus. The Anosov foliations arising here are not smooth in general, and so direct topological methods are necessary. This work originally had a gap (indicated by Anosov) which was filled by my student A. Brakhman in 1968.

You have recently considered topological problems arising from the physics of metals. What is the 'Novikov problem' concerning the motion of electrons along a Fermi surface, and how is it connected with real physics?

In 1982 I became interested in a fundamental geometric picture arising in the theory of metals. Each crystalline metal has a 'Fermi surface', a level surface of a Morse function on a three-dimensional torus corresponding to the dual lattice; this torus is called the 'quasi-momentum space'. The only electrons of importance for electrical conductivity at low temperatures are free electrons close to the Fermi surface. In a magnetic field, electrons begin to move along the Fermi surface. The trajectories of their motion on the universal covering $\mathbf{R}^3$ look like the intersections of the Fermi surface by planes perpendicular to the magnetic field. This dynamical system on the Fermi surface can be extremely complicated if the image of the fundamental group covers the entire lattice. To this end, the genus of the Fermi surface must be not less than 3. It is interesting that some metals (gold, copper, lead and platinum) satisfy this condition.

Many years ago, the well-known Soviet physicist I. Liftshitz and his school (M. Azbel', M. Kaganov, V. Peschanskii and others) formulated the principle of 'geometric strong magnetic field limit', which states that all essential properties of electrical conductivity in strong magnetic fields are determined by the above dynamical system on the Fermi surface. In normal metals, this description works for magnetic fields that do not exceed $10^{7}\Gamma$ (10^7 Gauss). What is the geometry and topology of this dynamical system? Is this system useful or not? These problems have been investigated at my seminar for many years since 1982. The work of my students A. Zorich, I. Dynnikov and S. Tsarev helped to overcome the main topological difficulties in 1984-1993.

However, my student A. Ya. Mal'tsev and I have recently established that the topological facts can be combined in an extremely successful way so as to lead to physical conclusions. It turns out that the conductivity in a strong magnetic field either vanishes or has a very special form characterised by a triple of 'topological integers'. These three numbers are topologically stable, being preserved under small perturbations of the direction of the magnetic field. This picture holds for a set of full measure (in the two-dimensional sphere) of directions of the magnetic field. For those particular directions for which this picture fails, the situation can be incomparably more complicated. According to my conjecture, these particular directions form a set whose fractal dimension is less than 1.

S.P. Novikov and M.F. Atiyah in Edinburgh in 1998

Behind this picture lie beautiful and deep theorems of three-dimensional topology. The observable triple of integers is in fact a two-dimensional homology class of the three-dimensional torus, called the 'support of the open trajectories'. For these physical systems, it turns out that the competition between topological complete integrability and stochasticity is won by integrable systems for the overwhelming majority of magnetic fields. Only a set of small fractal dimension are stochastic systems, and the investigation of this complicated set requires deeper analytical and numerical tools and exceeds the limits of standard differential topology.

Your research in metal physics has involved both topology and non-linear dynamics. What has been your experience in interacting with both mathematicians and theoretical physicists?

When working with physicists, I have aimed to find points of contact between science and the ideas and methods of modern mathematics that had not previously been used outside pure mathematics.

I was not interested in providing rigorous mathematical justification for results already obtained by physicists. I managed to find applications of topology and non-linear dynamics, of analysis on Riemann surfaces (algebraic geometry), and of some non-standard aspects of Riemannian geometry, in some areas of theoretical and mathematical physics where nobody expected such applications. Moreover, I have helped some prominent physicists, A. Polyakov, I. Dzyaloshinskii, G. Volovik and others, to apply topology in the theory of Yang-Mills fields and condensed matters physics.

Jacques-Louis Lions (1928-2001)

Philippe G. Ciarlet (Paris)

Jacques-Louis Lions was born in the heart of Provence in the charming city of Grasse, much renowned for its perfume industry and its historical centre.

In spite of his young age, he had the courage and determination to join the French Résistance at the end of 1943, as a soldier in the FFI (French Forces of the Interior). There he met Andrée, his wife and life-long companion.

Their son Pierre-Louis, who was born in 1956, would also be distinguished by

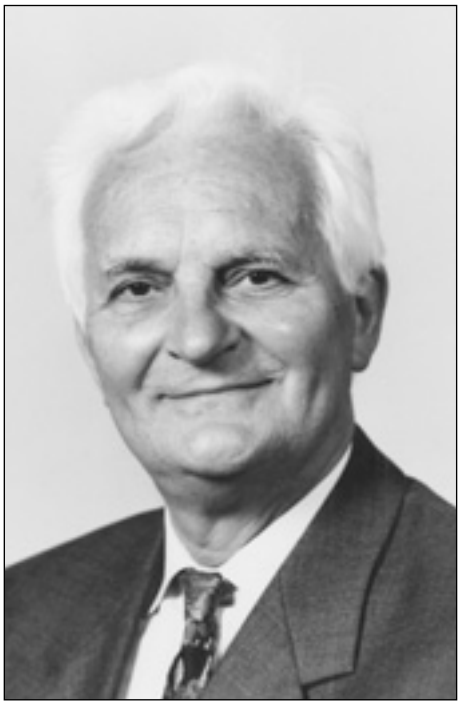


Photo: Collège de France (J.-P. Martin)

mathematical talent. This gift earned him the highest mathematical distinction, the Fields Medal, awarded to him during the 1994 International Congress of Mathematicians in Zürich. His parents had the great joy of being present on this unique occasion.

At the early age of nineteen, Jacques-Louis Lions passed the entrance exam to the highly coveted École Normale Supérieure de la rue d'Ulm. There he met Bernard Malgrange, among others, and at the end of their studies they both decided to opt for a university career in mathematics (a rather uncommon choice at a time when most 'Normaliens' would rather teach the famed 'classes de Mathématiques Spéciales' in the lycées). They were then awarded a grant by CNRS (the National Centre for Scientific Research) to prepare their doctoral dissertations, and went to Nancy to work under the guidance of a prestigious thesis advisor, Laurent Schwartz, who had just received the Fields Medal for his theory of distributions in 1950.

After defending his thesis in 1954, Jacques-Louis Lions began his career 'en province' (outside the Paris region) as was then customary, at the University of Nancy, where he held a professorship from 1954 to 1962.

Far from keeping him fully occupied, his remarkable mathematical achievements during that period left him enough time to envision the immense opportunities offered by scientific computing, which was then coming of age, with the manifold industrial applications that would henceforth become amenable. This constant quest for applications, that would guide him all his life and become one of the most exceptional aspects of his career, materialised in 1958 when he became scientific consultant for the SEMA (Society for Economics and Applied Mathematics), a society headed by Robert Lattès, who had entered the École Normale Supérieure one year after him. While such inclinations are common nowadays, it required lots of courage to follow them at that time. The applications of mathematics did not then arouse the enthusiasm that they now generate!

After Nancy, Jacques-Louis Lions was named professor at the University of Paris, where he very quickly created a weekly seminar on 'Numerical Analysis', a discipline that was practically unheard of in France at that time. This seminar first met in the basement of the Institut Henri Poincaré, then in a dusty room of the Institut Blaise Pascal, which was situated in the rue du Maroc in the North of Paris.

When the University of Paris split into thirteen distinct universities, he chose the sixth one, which was later to be named the Université Pierre et Marie Curie. Two of his major initiatives there were to found the Laboratoire d'Analyse Numérique (after thirty years on the Jussieu campus, this department was relocated in 1999 in the rue du Chevaleret, near Place d'Italie) and to create a DEA (Diplome d'Etudes Approfondies, a set of advanced courses that a doctoral student has to pass before beginning a dissertation), specialising in Numerical Analysis. This DEA, from which a considerable number of applied mathematicians now holding positions in universities, at CNRS, or in industry, have graduated over the years, was always highly regarded. The degree is now one of the most successful components of the 'Jussieu-Chevaleret Doctoral School of Mathematical Sciences', headed by Yvon Maday.

In 1973, at the early age of forty-five, Jacques-Louis Lions had the highly unusual honour of being named professor at the celebrated Collège de France and simultaneously elected to the French Academy of Sciences. At the Collège de France, he held the Chair in Mathematical Analysis of Systems and of their Control, for twenty-five years. His series of lectures, which in the tradition of the Collège had to be renewed each year, were always attended by vast audiences, attracting not only his own students but also the students of his students!

The Seminar in Applied Mathematics that he organised there until 1998, first with Jean Leray and then with Haïm Brezis, soon became an 'institution within an institution'. Indeed, countless applied mathematicians, from Paris and its vicinity and French and foreign colleagues visiting Paris, gathered each Friday afternoon to hear prestigious lecturers, such as Stuart Antman, John Ball, Felix Browder, Ciprian Foias, Gu Chao-hao, Li Ta-tsien, Klaus Kirchgässner, Peter Lax, Andrew Majda, Louis Nirenberg, Olga Oleinik, Sergei Sobolev, Tosio Kato, Mark Vishik, and many others.

From 1966 to 1986, Jacques-Louis Lions was also part-time professor at the École Polytechnique, where he created a course in numerical analysis from scratch, that soon became a legend! Following the rule at the École Polytechnique, he also wrote lecture notes whose contents were revolutionary for the time, at least in France. Indeed these notes constituted a kind of encyclopaedia in which, with his natural gift for teaching, Jacques-Louis Lions described and analysed practically all that was then known about the numerical analysis of partial differential equations. Introductions to numerical optimisation and numerical linear algebra were also presented in two separate chapters written by his first two doctoral students, Jean Céa and Pierre-Arnaud Raviart. A mystery remains about the first versions of these lecture notes: they were affectionately referred to as 'the Diplodocus', even though no-one (including their author) ever seemed to understand why!

But all of these essentially academic activities that would normally occupy all of one's time did not take up all of his. Far from it! From 1980 to 1984, he was also President of INRIA (National Institute for Research in Computer Science and Automatics), normally a full-time position! His leadership was of profound and lasting influence at INRIA. During his first weeks at the head of this institute, he used his incredible talents as an organiser to rejuvenate the organisation and objectives – in particular, by introducing the notion of a project, gathering a clearly identified team around a well-defined objective on a specific theme.

During his four-year term as president, he strongly advocated the creation of start-up companies by researchers from the institute and he initialised its decentralisation through the creation of similar institutes at Sophia-Antipolis and Rennes. Through his personal prestige, the teams he was able to gather, and the numerous first-class international conferences that he organised there, he greatly contributed to the fame of INRIA.

From 1984 to 1992, he held another high-level, and also normally full-time, official position as President of CNES (National Centre for Space Studies), where he continued and developed the action of his predecessor Hubert Curien, who had just been named Minister of Research and Technology. There he used not only his eminent intellectual capacities but also his

talents for intelligent persuasion to convince the French authorities that the directions that he advocated were well founded. In this way, he played a major role in the conception of the French-American 'Topex-Poseidon' space program for oceanography. Topex-Poseidon is also the name of the satellite that made it possible at last to understand 'El Niño', a major event in climatology. His influence was likewise a decisive factor in the French-Russian negotiations that ultimately allowed Jean-Loup Chrétien and Michel Tognini to participate in manned space missions.

For many years his presence at the Monday afternoon seances of the French Academy of Sciences were rare. But he eventually gave new life to this noble 'Compagnie' (as it is traditionally known among its members) when he became President in January 1997 for the customary two years. Immediately after Lions took office, President Jacques Chirac gave him the mission of supervising the drafting of a document concerning the state of the art world-wide in each of the following areas: access to knowledge for all and electronic processing of information; knowledge of our planet and ways of life; and understanding life systems and improving health-care for all. He immediately began to work on this ambitious undertaking by creating and heading a 'Committee 2000', under his ongoing close supervision, whose task was to analyse the three areas and make proposals. Remarkably, in spite of the scope of this project, he was able to meet the 2000 deadline he had set himself, and personally handed President Chirac the requested document during a ceremony at the Elysée Palace on 25 January 2000. He even succeeded in having all the Members and Corresponding Members of the Academy invited for the occasion, a first indeed!

However, Jacques-Louis Lions's actions during his presidency were not limited to Committee 2000. His efforts were also decisive in promoting the need for a profound reform in the status of the Academy; the principles of this reform have now been accepted. He also played a major role in the creation of an Academy of Technology, always desired but never previously achieved. This academy was eventually created on 12 December 2000.

As exemplified by his presidencies at INRIA and CNES, Lions was an exceptionally successful promoter of ever-closer ties between academic research, too often seen as disconnected from the real world, and the more pragmatic industrial research. In this spirit, he headed scientific committees in major public utility companies, such as Météorologie Nationale, Gaz de France, France Telecom and Electricité de France, and he held high level advisory positions in major companies, such as Pechiney, Dassault Aviation, or Elf.

Jacques-Louis Lions's influence extended far beyond frontiers. Since the beginning of his career, he was an indefatigable traveller who, in addition to the traditional venues in Europe and the Americas, very quickly added more unusual ones to his list of destinations. For instance, as early as 1957 he set out for a three-month visit to the Tata Institute of Fundamental Research in Bombay – at the time a genuinely adventurous trip! He enjoyed the splendour of the ancient Taj Mahal Hotel and the hospitality of Kollagunta Gopalaiyer Ramanathan, with whom he contributed to the creation of an applied branch of the Tata Institute on the campus of the Indian Institute of Sciences in Bangalore, twenty years later.

In 1966 he began an extended series of visits to the former Soviet Union. Frequently invited by the USSR Academy of Sciences or by the Novosibirsk Institute for Computation, he initiated many scientific exchanges with eminent soviet mathematicians such as Guri Marchuk, Olga Oleinik, Lev Semenovitch Pontryagin, Ilia Vekua, Mark Visik and Nicolay Nicolayevich Yanenko. One of his merits during this period, and not the least, was to contribute greatly to the dissemination in the West of Soviet research in applied mathematics. One particular trip that left him with a lasting impression was the journey that he undertook in 1975 to Beijing, where he was received with great ceremony. He was particularly impressed there by the mathematical talents of Feng Kang, who had just independently rediscovered the finite element method. He was also impressed by Feng Kang's impetuosity when he spoke about the Gang of Four!

However, his international ventures were not limited to traditional scientific exchanges, as his talents as a lecturer, thesis adviser, and organiser produced many disciples throughout the countries he visited. As early as the 1960s, for instance, he was the adviser of Antonio Valle, the first in a long series of students from Spain and Portugal, who in turn set up numerical analysis departments at the Universities of Malaga, Sevilla, Santiago de Compostela, Lisboa, and at the Universidad Complutense de Madrid, modelled after the one he had created in Paris. In the same vein, he was the main speaker in a 1997 European video-conference on 'Mathematics and the Environment', organised in Madrid by Jesus Ildefonso Diaz. He also chaired the Prize Committee that awarded the ten 'Prizes for Young Mathematicians', during the Third European Congress of Mathematics, held in Barcelona in 2000.

For many years, he also chaired the Scientific Committee of the Istituto di Analisi Numerica del CNR of the University of Pavia, headed for several decades by Enrico Magenes and then by Franco Brezzi.

Together with Paul Germain, he represented France at the 1975 meeting on 'Functional Analysis and Mechanics' of the IUTAM (International Union for Theoretical and Applied Mechanics), held in Luminy, where the other representatives were Klaus Kirchgässner from West Germany, Sir James Lighthill from the United Kingdom, and William Prager from the United States.

His intelligent proselytising was not limited to Europe, however. In China, for instance, he was one of the driving forces behind the creation in 1997 of the LIAMA (French-Chinese Laboratory of Computer Science, Automatics, and Applied Mathematics), an offspring of INRIA and Academia Sinica, housed ever since by the Institute of Automatics of the Academy of Sciences in Beijing. He likewise played a major role in the creation in 1998 of the ISFMA (Chinese-French Institute of Applied Mathematics), splendidly housed by the Department of Mathematics of Fudan University in Shanghai, thanks to the tireless efforts of its Director Li Ta-tsien.

From 1991 to 1995 Jacques-Louis Lions was President of the IMU (International Mathematical Union). During a meeting of this organisation in Rio de Janeiro, on 6 May 1992, he proposed that the year 2000 be named 'World Mathematical Year'. This proposal, which was later supported by UNESCO, turned out to be a genuine success story that significantly contributed to the improvement of the image of mathematics among the general public and helped to encourage mathematical research in developing countries.

He likewise was a constant supporter of the initiatives of the Third World Academy of Sciences (TWAS), either directly or through colleagues from his group. Particularly noteworthy in this respect were his undertakings for the progress of mathematical research in Africa.

The mathematical works of Jacques-Louis Lions are immense. Alone, or in collaboration, he wrote more than twenty books, most of which have become classics (often translated into several foreign languages), as well as more than five hundred papers. The different themes of his work are briefly described below, in

approximately chronological order.

He had, and will continue to have for a long time, a considerable influence on mathematics and its applications, not only through his own work, but also through that of the School he created and constantly kept in touch with. Over the years this School, which numbered some fifty initial students and scores of students of students, etc., has acquired widespread fame, not only in university circles, but also in industry – an accurate indication that the directions of research he envisioned and promoted were highly relevant.

If a single title were to be attached to Jacques-Louis Lions's mathematical works, it might be with a fair degree of accuracy that of 'Partial differential equations in all their aspects: existence, uniqueness, regularity, control, homogenisation, numerical analysis, etc., and the applications they model, such as fluid and solid mechanics, oceanography, climatology, etc.'.

Jacques-Louis Lions produced his first mathematical works in 1951. At the same time, two major books were published, one by Laurent Schwartz on the theory of distributions and one by Sergei Sobolev on their applications to mathematical physics, as well as a founding paper by John von Neumann and Robert Richtmyer on the numerical approximation of non-linear hyperbolic problems arising in hydrodynamics.

Inspired by these works, Lions's first objectives were to undertake a systematic study of linear and non-linear boundary value problems – notably, by constantly using the theory of distributions, and then finding ways to numerically approximate their solutions.

In 1954, he began a series of collaborations and lasting friendships with eminent Italian mathematicians, such as Enrico Magenes, Guido Stampacchia, Ennio de Giorgi and Giovanni Prodi (brother of the current President of the European Union). One such collaboration resulted in an exhaustive analysis of boundary value problems posed in fractional Sobolev spaces, due in particular to the theory of interpolation between Banach spaces that he initiated with Jack Peetre in 1961. This analysis is the object of the celebrated three-volume treatise *Non-homogeneous boundary value problems and applications* (1968-70) that he wrote with Enrico Magenes. From 1965 to 1967, he developed with Guido Stampacchia the foundations of the theory of variational inequalities, as they appear (for instance) in unilateral problems in elasticity.

His inclination towards applications led him to propose a particularly elegant proof of Korn's inequality, based notably on a fundamental result in distribution theory known as 'Lions's lemma' (although several other results of his bear the same name!). He further developed applications of the theory of variational equations or inequalities to mechanics, by mathematically analysing Bingham fluid, friction, viscoelasticity and plasticity models. These applications constitute the substance of another well-known book, *Inequalities in mechanics and physics* (1972), that he wrote with Georges Duvaut.

He was equally interested in the numerical simulation of these problems, at

a time when it was realised that the applicability of finite difference methods had reached its limits; for instance, these methods do not perform well when the problems to be approximated have rapidly varying coefficients or are posed on domains with complicated geometries. On the other hand, the finite element method, already familiar to engineers when handling these types of difficulties, remained essentially unknown to mathematicians.

With remarkable intuition, Jacques-Louis Lions immediately foresaw that it is preferable to discretise the variational, or weak, formulations of partial differential equation problems, rather than the partial differential equations themselves. Accordingly, he quickly pointed out to his group of colleagues and students the need for studying and analysing Galerkin methods in general, and finite element methods in particular. A productive period ensued, to which he himself contributed with another classic, *Numerical analysis of variational inequalities* (1976), co-authored with Roland Glowinski and Raymond Trémolières.

His 1969 book *Some methods for solving non-linear boundary value problems* was a major contribution to the theory of non-linear partial differential equations, which even today remains a substantial source of inspiration – it is unfortunate that this book was never translated into English. In this work, Lions introduced and systematically analysed the so-called compactness methods, which play a key role in the existence theory for the Navier-Stokes and von Kármán equations, the monotony methods he had developed with Jean Leray, and the regularisation and penalty methods, which can for instance be applied to the Schrödinger or Korteweg-de Vries equations. For the most part, the results found in this book are either due to himself or to his students – in particular, Haïm Brezis and Luc Tartar.

Most of the works mentioned so far, together with the many generalisations they led to, were assembled in the monumental treatise *Mathematical analysis and numerical methods for sciences and technology* (1984-5), conceived and edited by Jacques-Louis Lions and Robert Dautray. This work, which comprises almost four thousand pages, is justly regarded as the modern counterpart of the celebrated Courant-Hilbert work.

His on-going interest in problems with small parameters led him to write *Singular perturbations in boundary value problems and in optimal control* (1973), in which he laid down the foundations of the asymptotic analysis of such problems. The methods and notions that he then introduced and analysed, such as *a priori* estimates, stiff problems, boundary layers, multiple scales, and so on, were subsequently recognised as fundamental for many applications; for instance, they later played a major role in the mathematical modelling of elastic structures and 'multi-structures' made of plates, rods or shells.

Another field where small parameters arise naturally is in the modelling of composite materials – of constant use in the aerospace industry, for instance. Their asymptotic analysis, a special case of what became known as 'homogenisation theory', was abundantly developed and illustrated by applications in another seminal work, *Asymptotic analysis for periodic structures* (1978), which he wrote with Alain Bensoussan and George Papanicolaou. In this book, a substantial number of essentially empirical formulas used in the modelling of periodic structures were rigorously justified for the first time, thanks notably to the compensated compactness method of his students Francois Murat and Luc Tartar and to the oscillating test-functions method of Luc Tartar.

In 1958, a fundamental work by Lev Semenovitch Pontryagin on the optimal control of systems governed by ordinary differential equations (the objective was to control the trajectories of artificial satellites) immediately attracted his attention. Through the contacts he already had at that time with the engineering community, he quickly became convinced that the next step was to extend optimal control to distributed systems – systems whose state is governed by partial differential equations. The inclination that he then developed for the optimal control of such systems was always to remain at the centre of his mathematical interests.

A pioneer, as always, he began by laying down the foundations of a general theory in yet another celebrated book, *Optimal control of systems governed by partial differential equations* (1968), in which he notably introduced an infinite-dimensional version of the Riccati equation.

In two books co-authored with Alain Bensoussan, *Applications of variational inequalities to stochastic control* (1978) and *Impulse control and variational inequalities* (1983), he continued his investigations by considering in particular the optimal control of systems that are not necessarily well posed, or that have multiple states.

After having so thoroughly analysed the main aspects of optimal control theory, Lions shifted his interests to the study of

'controlability', a discipline that basically seeks to answer the following type of question: given a system in an arbitrary initial state, how can one devise a way of acting on it in such a way that its solution reaches a given final state in a finite time – for instance, by imposing adequate boundary conditions?

During his prestigious 'John von Neumann Lecture' at the SIAM Congress in Boston in 1986, he presented for the first time his now-famous 'HUM' (Hilbert Uniqueness Method) for the exact controlability of linear time-dependent equations. He chose this particular terminology to emphasise the fact that the feasibility of such controlability is related in an essential way to the uniqueness of the solution to the adjoint problem, typically obtained by the Holmgren or the Carleman theorem.

This lecture was the starting point of numerous works by himself and his School. In particular, he began by publishing no fewer than three books on the subject in the same year: *Exact controlability, perturbations and stabilisation of distributed systems* in two volumes (1988) and, with John Lagnese, *Modelling, analysis, and control of thin plates* (1988), which contains an abundance of applications to the theory of elastic plates. In 1995, he established with Enrique Zuazua the generic character of the controlability of the three-dimensional Stokes equations: if there is no approximate controlability for a given open set, then it is always possible to find another arbitrarily close open set for which this type of controlability holds.

These works constituted yet another mark of his continuing interest in real-life applications. He also was concerned to propose numerically feasible approximation methods. These formed the theme of an article co-authored with Roland Glowinski – an article so long that its nearly three hundred pages took up two consecutive issues of *Acta numerica* (1994-5).

Even though the last works of Jacques-Louis Lions lay in different areas, they continued to be partly influenced by the methodology he had developed for questions of controlability.

In 1990, he started to express his great interest in climatology in *El planeta tierra*. In this book, which was directly published in Spanish, he described in a masterly fashion and with a remarkably accessible style the most important problems in this science, such as modelling, numerical simulation, sensitivity to initial conditions, etc. His last courses at the Collège de France, from 1994 to 1998, were on these subjects.

The models found in climatology include complex systems of partial differential equations, such as those of Navier-Stokes and of thermodynamics. But these systems had never been seriously analysed from a mathematical viewpoint, although they had been extensively used since the 1960s for numerical simulation in weather forecasting.

In spite of the 'truly diabolic complexity' (as he was fond of saying) of the combination of partial differential equations, boundary conditions, transmission conditions, non-linearities, physical assumptions, etc., that enter these models, Jacques-Louis Lions, together with Roger Temam and Shouhong Wang, was able to study the existence and uniqueness of solutions, in order to establish the existence of attractors and to propose numerical methods. He even succeeded in teaching these works on a blackboard, a pedagogical tour de force!

In 1995, he began another series of works. With Evariste Sanchez-Palencia he developed the theory of sensitive problems, exemplified by the boundary value problems that appear in the theory of linearly elastic membrane shells. In such problems – which in a sense constitute the antithesis of well-posed problems – arbitrarily small, yet arbitrarily smooth, changes in the right-hand sides of the equations may induce 'sudden' changes in the properties of their solutions. It is perhaps no coincidence that the analysis of such problems relies in particular on uniqueness theorems that bear resemblance with those needed in the HUM.

In his last works, Jacques-Louis Lions returned to the numerical analysis of parallel algorithms and domain decomposition methods, in a long series of *Notes aux Comptes Rendus de l'Académie des Sciences*, most often co-authored with Olivier Pironneau and published from 1997 to 2001. In fact, these kinds of topics had been on his mind for a long time: as early as the 1980s, he had already been an ardent advocate of installing a parallel computer at INRIA. The main idea in these *Notes* is to introduce parallelism in the continuous problem, rather than in the discrete one – an approach that is in fact quite general, since it applies equally well to any problem that is approximated by an iterative method, such as a fractional step method, a decomposition method into subproblems in optimisation theory, a domain decomposition method, and so forth.

One can only be impressed by these immense works, whether by the quality, diversity, and novelty of the mathematics used, or by the permanent quest for new applications that were previously believed to be inaccessible.

Like John von Neumann, whom he deeply admired, Jacques-Louis Lions was a visionary, who very quickly understood that the availability of ever-increasing computational power could revolutionise the modelling of phenomena and thereby improve our knowledge and mastery of the physical world, provided however that the required mathematics was simultaneously created and developed. He admirably contributed to this latter task.

Jacques-Louis Lions justly received numerous honours. Although he always remained modest about them, their list is truly astonishing. He was Commander of the French Legion of Honour and Great Officer of the French National Order of Merit, a distinction he received at the hands of President Chirac on 23 February 1999. He was a member of twenty-two foreign academies and *Honoris Causa* Doctor of nineteen universities.

He also received the most prestigious prizes and delivered the most coveted lectures. He was in particular awarded three Prizes by the French Academy of Sciences, the John von Neumann Prize in 1986, the Harvey Prize from the Technion in 1991, and the Lagrange Prize at the ICIAM meeting in Edinburgh in 1999. Jacques-Louis Lions was proud to have had

the rare honour of having shaken the hand of Emperor Akihito, when he received the highly prestigious Japan Prize in 1991. It was the climax of a perfectly and meticulously organised week that had particularly impressed him!

On three occasions he was an invited speaker at the International Congress of Mathematicians – in 1958, 1970, and 1974. He gave the John von Neumann Lecture at the SIAM meeting in Boston in 1986, was plenary speaker at the ICIAM Congress in Hamburg and at the SIAM Congress in Philadelphia in 1995, and held the Galileo Chair at the University of Pisa in 1996. He also had the extremely rare honour for a scientist, especially for a mathematician, of speaking before a parliament! As part of the celebrations for 'World Mathematical Year 2000', he delivered an address entitled 'Will it ever be possible to describe, understand, and control the inanimate and animate world by means of the languages of mathematics and informatics?' in front of the Cortes, who specially gathered for the occasion in Madrid on 21 January 2000.

He belonged to the most famous academies, such as the USSR Academy of Sciences and the American Academy of Arts and Sciences, to which he was elected in 1982 and 1986. In 1996, he was simultaneously elected to the Royal Society of the United Kingdom, the National Academy of Sciences of the USA, and the Third World Academy of Sciences. Two years later he was elected to the Academia Sinica of China and the Accademia Nazionale dei Lincei in Rome. The Pontifical Academy of Sciences, to which

he was elected in 1990, seemed to be particularly dear to him; it may be less well known, but it is an unusually rare honour to become one of its members!

Who was the man behind all these endeavours? What I knew of him convinced me that both his human and professional qualities were truly exceptional.

Jacques-Louis Lions wrote abundantly, very rapidly, and with an astonishing ease – not only in mathematics, but also countless letters, his favourite means of communication. He was a master with the fax, which he used with amazing efficiency! For instance, it was not uncommon for each of his various collaborators at any given time to receive four or five faxes per week, sometimes with up to thirty pages if their contents were mathematical.

Even though he wrote abundantly, he confessed that he rarely kept track of his manifold letters, perhaps because he could rely entirely on his memory, or perhaps because he preferred to spare himself a herculean archival task! Let us hope that his correspondents had the good sense to keep his letters, which could thus be later compiled.

By any measure, his abilities were astounding. For instance, he once told me that it took him only a few weeks to write the several hundred pages of his 'Diplodocus' lecture notes, mentioned earlier. Likewise, his indifference to lack of sleep or the most extreme jet-lag, and his freshness after lengthy flights, were always a subject of astonishment among his travel companions.

As John Ball put it so well, 'Jacques-Louis Lions was a man of considerable personal magnetism and charm, whose charisma, brilliance as a teacher, and accessibility attracted others to work with him'. And indeed, it was obvious that Jacques-Louis Lions had an ample share of charisma, even if charisma is not easy to define in a rigorous manner! He was also incredibly open and displayed such amiable and simple manners that any one of his current students and collaborators felt that they were at the centre of his attention.

He was also very brave in the face of physical danger and suffering. Even when the pain became unbearable, he never complained, keeping on the contrary his compassion for others. All those who met him will cherish the memory of his warm personality, the vision that he so well conveyed, and his profound intelligence.

Books by Jacques-Louis Lions

Lectures on elliptic partial differential equations, Tata Institute, Bombay, 1957.
Equations différentielles opérationnelles et problèmes aux limites, Springer-Verlag, 1961.
Problèmes aux limites dans les équations aux dérivées partielles, Presses de l'Université de Montréal, 1962.
Méthodes de quasi-réversibilité et applications (with R. Lattès), Dunod, 1967; English translation: *Quasi-reversibility methods and applications*, American Elsevier, 1969.
Contrôle optimal de systèmes gouvernés par des equations aux dérivées partielles, Dunod, 1968; English translation: *Optimal control of systems governed by partial differential equations*, Springer-Verlag, 1970.
Problèmes aux limites non homogènes et applications (with E. Magenes), 3 vols., Dunod, 1968-70; English translation: *Non-homogeneous boundary value problems and applications*, Springer-Verlag, 1972-3.
Quelques méthodes de résolution des problèmes aux limites nonlinéaires, Dunod, 1969.
Les inéquations en mécanique et en physique (with G. Duvaut), Dunod, 1972; English translation: *Inequalities in mechanics and physics*, Springer-Verlag, 1976.
Some aspects of the optimal control of distributed parameter systems, CBMS Conference **6**, SIAM, 1972.
Sur le contrôle optimal des systèmes distribués, Monographie **20**, Enseignement Mathématique, 1973.
Perturbations singulières dans les problèmes aux limites et en contrôle optimal, Lecture Notes in Mathematics **323**, Springer-Verlag, 1973.
Analyse numérique des inéquations variationnelles (with R. Glowinski and R. Trémolières), 2 vols., Dunod, 1976.
Numerical analysis of variational inequalities, North-Holland, 1981.
Sur quelques questions d'analyse, de mécanique et de contrôle optimal, Presses de l'Université de Montréal, 1976.
Applications des inéquations variationnelles au contrôle stochastique (with A. Bensoussan), Dunod, 1978.
Asymptotic analysis for periodic structures (with A. Bensoussan and G. Papanicolaou), North-Holland, 1978.
Some methods in the mathematical analysis of systems and their control, Science Press, Beijing and Gordon & Breach, 1981.
Applications of variational inequalities to stochastic control, North-Holland, 1982.
Contrôle impulsionnel et inéquations variationnelles (with A. Bensoussan), Gauthier-Villars, 1982.
Impulse control and variational inequalities, Heyden & Son, 1984.
Contrôle des systèmes distribués singuliers, Gauthier-Villars, 1983.
Analyse mathématique et calcul numérique pour les sciences et les techniques (with R. Dautray), 3 vols., Masson, 1984-8.
Mathematical analysis and numerical methods for science and technology, 9 vols., Springer-Verlag, 1988-93.
Contrôlabilité exacte, perturbations et stabilisation de systèmes distribués, 2 vols., Masson, 1988.
Modelling, analysis and control of thin plates (with J. Lagnese), Masson, 1988.
El planeta tierra, Instituto de España, Espasa-Calpe, 1990.
Sentinelles pour les systèmes distribués à données incomplètes, Masson, 1992.
Models for the coupled atmosphere and ocean (with R. Temam and S. Wang), *Computational Mechanics Advances* **1**, North-Holland, Amsterdam, 1993.

Series edited by Jacques-Louis Lions

Nonlinear partial differential equations and their applications, Collège de France Seminar (with H. Brezis), 12 vols., Pitman-Longman, 1981-94.
Mathématiques appliquées pour la maîtrise (with P. G. Ciarlet), 21 vols., Masson, 1982-97.
Recherches en mathématiques appliquées (with P. G. Ciarlet), 42 vols., Masson, 1985-97.
Handbook of numerical analysis (with P. G. Ciarlet), 7 vols., North-Holland, 1990-2000.
Nonlinear partial differential equations and their applications, Collège de France seminar (with D. Cioranescu), 2 vols., Pitman, 1998-2001.

Books dedicated to Jacques-Louis Lions

Analyse mathématique et applications, Contributions en l'honneur de Jacques-Louis Lions, Gauthier-Villars, 1988.
Frontiers in pure and applied mathematics, A collection of papers dedicated to Jacques-Louis Lions on the occasion of his sixtieth birthday (ed. R. Dautray), North-Holland, 1991.
Equations aux dérivées partielles et applications, Articles dédiés à Jacques-Louis Lions, Gauthier-Villars, 1998.

Olga Arsienevka Oleinik

Professor Olga Arsienevna Oleinik passed away on 11 October at the age of 76. She made her mark throughhout the world with her articles (almost three hundred!) and her monographs. After having completed her thesis under the guidance of Professor Petrovski, she began her career in the Moscow State University. She became professor in the same university, and for a long period was held the Chair of Differential Equations. She has guided much research, was the adviser of more than fifty mathematicians, some twenty of whom obtained the degree of Doctor of Science. The range of interests of Professor Oleinik was very wide, from the study of real analytic manifolds (in connection with Hilbert's sixteenth problem) to the questions of existence and uniqueness of solutions of linear and non-linear partial differential equations.

She is the originator of very general and elegant proofs of Korn's inequality, an essential tool in the theory of elasticity. She gave talks at numerous international congresses and seminars in universities throughout the world. She was a member of the Russian Academy of Sciences and other academies, and was also a Doctor *Honoris Causa* of many foreign universities. Professor Oleinik was awarded the medal of the Collège de France. J. Leray and J.-L. Lions invited her several times to this eminent institution, since some of her work was related to that of those two distinguished mathematicians.

She will also remembered as a lady with a very strong personality. She was very generous with her colleagues, and her friendship, once acquired, was limitless. Her loss will be deeply felt by the international mathematical community.

Mireille Chaleyat-Maurel, Université Pierre et Marie Curie, Laboratoire de Probabilités, 16, rue Clisson et 175/179 rue du Chevaleret Bureau 4D16, 75013 Paris (France)

Ukranian Mathematical Congress (UMC-2001)

Anatoly M. Samoilenko

The Ukrainian Mathematical Congress was held in Kiev on 21-23 August 2001. It was dedicated to the 200th anniversary of the birth of M.V. Ostrohradsky, a prominent Ukrainian mathematician.

The Congress was organised by the Institute of Mathematics of the National Academy of Sciences of Ukraine, under the auspices of the National Academy of Sciences of Ukraine, the Ministry of Education and Science of Ukraine, the Institute of Applied Mathematics and Mechanics of the National Academy of Sciences of Ukraine, T. Shevchenko Kiev National University, M. Drahomanov National Pedagogic University, the Ukrainian Charitable Foundation for Furthering Development of Mathematical Science, the 'Ukrtelecom' joint-stock company, and Kiev City State Administration.

This event became the first attempt to gather at one major scientific meeting all the scientists of Ukraine that work in mathematics and related fields, thus making it possible to assess the contemporary state of this important scientific direction and prospects for its further development in Ukraine.

Within the framework of the Congress, twelve satellite international scientific conferences were held in different fields of contemporary mathematics.

The work of the Congress proceeded in thirteen parallel sections in the main fields of mathematics:
Algebra and theory of numbers (Chair: A.V. Roiter)
Dynamical systems (Chair: O.M. Sharkovsky)
Differential equations and non-linear oscillations (Chair: A.M. Samoilenko)
Complex analysis and potential theory (Chair: P.M. Tamrazov)
Mathematical physics (Co-Chairs: A.H. Nikitin and D.Ya. Petryna)
Teaching methods and history of mathematics (Co-Chairs: O.M. Bogolyubov, M.I. Shkil' and M.I. Yadrenko)
Non-linear analysis (Chair:I.V. Skrypnik)
Computational mathematics and mathematical problems of mechanics (Co-Chairs: V.M. Koshlyakov, I.O. Lukovs'ky, V.L. Makarov and I.V. Serhienko)
Probability theory and mathematical statistics (Co-Chairs: V.S. Korolyuk and M.I. Portenko)
Theory of approximations and harmonic analysis (Co-Chairs: M.P. Korneichuk and O.I. Stepanets')
Theory of operators and differential operator equations (Co-Chairs: Yu.M. Berezans'ky and M.L. Horbachuk)
Topology and geometry (Co-Chairs: O.A. Borisenko and V.V. Sharko)
Mathematical theory of control (Co-Chairs: M.Z. Zhurovs'ky, V.S. Mel'nyk and A.A. Chykrii)

Section sessions were held at the Institute of Mathematics of the National Academy of Sciences of Ukraine and M. Drahomanov National Pedagogic University.

385 scientists participated in section sessions. Among them were 82 foreign mathematicians (52 from the CIS and 30 from other foreign countries). In all, scientists from 27 countries participated in the sessions; the greatest number of foreign participants came from Russia, USA, Germany, Italy, Byelorussia and Uzbekistan. In total, more than 1500 scientists from 40 countries (including about 260 from the CIS and 160 from other foreign countries) participated in the Ukrainian Mathematical Congress and satellite conferences. Below, we present the list of satellite conferences.
10-17 June: *Stochastic Analysis and its Applications* (Lviv)
2-8 July: *Third International Algebraic Conference in Ukraine* (Sumy)
9-15 July: *Fourth International Conference on Symmetry in Non-linear Mathematical Physics* (Institute of Mathematics, National Academy of Sciences of Ukraine, Kyiv)
7-12 August: *International Conference on Complex Analysis and Potential Theory* (Kyiv)
13-17 August: *Theory of Functions and Mathematical Physics* (Kharkiv)
22-26 August: *International Conference on Functional Analysis* (Institute of Mathematics, National Academy of Sciences of Ukraine, Kyiv)
22-28 August: *XV International Conference on Non-linear Partial Differential Equations NPDE-2001* (Kyiv)
27-29 August: *Differential Equations and Non-linear Oscillations* (Chernivtsi)
27-29 August: *Computational Mathematics and Mathematical Problems of Mechanics* (Drohobych)
27-29 August: *International Algebraic Conference* (Uzhhorod)
11-14 September: *Fourth International Conference on Geometry and Topology* (Cherkasy)
1-5 October: *New Approaches to the Solution of Differential Equations* (Drohobych)

In view of the large number of lectures delivered at the Congress, we mention only well-known mathematicians and those representatives of the Ukrainian Parliament and Government who made greeting speeches at the opening ceremony of the Congress: I.R. Yukhnovsky, Head of the Committee on Science and Education at the Ukrainian Parliament, academician of the National Academy of Sciences of Ukraine (on behalf of the Ukrainian Parliament); Ya.S. Yatskiv, First Deputy Minister of Education and Science of Ukraine, academician of the National Academy of Sciences of Ukraine (on behalf of the Ministry of Education and Science of Ukraine); S.O. Dovhyi, Head of the Ukrainian State Committee on Communications and Information (on behalf of the Ukrainian Government); I.V. Skrypnik, Academician-Secretary of the Department of Mathematics and academician of the National Academy of Sciences of Ukraine (on behalf of the Ukrainian Mathematical Society and the Department of Mathematics of the National Academy of Sciences of Ukraine); Rolf Jeltsch, EMS President (on behalf of the European Mathematical Society); Blagovest Sendov, academician of the Bulgarian Academy of Sciences, foreign member of the National Academy of Sciences of Ukraine (on behalf of the Bulgarian Academy of Sciences); W. Wendland (Stuttgart); Nguyen Van Dao (Vietnam), President of the Hanoi National University, foreign member of the National Academy of Sciences of Ukraine; M.M. Lavrent'ev (Russia), Director of the Institute of Mathematics of the Siberian Division of the Russian Academy of Sciences, academician of the Russian Academy of Sciences; D. Matarazzo (Italy); Roman Andrushkiv (USA), Deputy President of the T. Shevchenko Scientific Society; V.G. Bar'yakhtar, member of the Presidium of the National Academy of Sciences of Ukraine, academician of the National Academy of Sciences of Ukraine; V.O. Marchenko, academician of the National Academy of Sciences of Ukraine; Yu.O. Mitropolsky, Honorary Director of the Institute of Mathematics of the National Academy of Sciences of Ukraine, member of the Presidium of the National Academy of Sciences of Ukraine, academician of the National Academy of Sciences of Ukraine; V.V. Petryshyn (USA), foreign member of the National Academy of Sciences of Ukraine; M.I. Shkil', Rector of the M. Drahomanov National Pedagogic University, academician of the Academy of Pedagogic Sciences.

Anatoly M. Samoilenko was Head of the Organising Committee of UMC-2001, is President of the Ukrainian Mathematical Society and is an Academician of the National Academy of Sciences of Ukraine.

Opening speech by Rolf Jeltsch, EMS President at the Ukranian Mathematical Congress

Let me thank the organisers and Prof. Skrypnyk for the invitation and the very warm welcome. I am very happy that I am allowed to represent the European Mathematical Society at this important Conference. I read though the programme this morning and was very impressed by the richness of the presentations, with almost 400 lectures.
Let me take the opportunity to tell you a little bit about the European Mathematical Society. The EMS was founded in 1990. It has a double structure, in the sense that it is a society of societies, but also of individual members.

It consists of about 50 member societies covering all of Europe, from Iceland to Georgia and from Norway to Israel and Portugal at the southern end. Subject-wise we cover all of mathematics, pure and applied, up to and including industrial applications.

It may not be known to you that you can use your reviewing of articles for *the Zentralblatt* to become an individual member. Members receive our *Newsletter* every three months.

What are our scientific activities? The largest is of course the European Congress of Mathematics. We are already working hard together our Swedish colleagues on the 2004 congress in Stockholm. I know that our colleagues from Sweden will seek funds to support participants from Eastern Europe. During these congresses the EMS gives ten prizes to young mathematicians in all fields, and the Felix Klein Prize for an application in industry.

For young researchers we organise two summer schools every year. This year we had one in St Petersburg, and one in Prague; its topic is the simulation of fluid and body interaction. Next year's summer schools will be in Israel on Computational algebraic geometry and applications, and in Romania in fluid mechanics. At the beginning of September, EMS is co-organising a large Conference in applied mathematics with SIAM, the Society for Industrial and Applied Mathematics.

Before I move to other activities let me tell you that you can find a lot of information about the EMS on our web page, *http://www.emis.de* In particular you will find the address of the committee to support Eastern Europeans to attend conferences. Unfortunately the EMS is financially weak and hence these funds are very limited.

Currently the EMS is setting up a publishing house. The managing director will be Dr. Hintermann and he will start in two weeks. The idea is to offer existing journals to move from expensive commercial publishers to our non-profit organisation.

In addition to these activities we work on a political level in the European Union. We try to make the scientific programmes of the EU more usable for mathematicians. For example, for you it will be of interest that up to now one could not support Ukrainian participants at conferences from EU money. However, we have been able to push that this will be changed in the 6th Framework programme which starts in 2003. Moreover, it looks like the handling of funds will be easier too.

Great changes are also happening on the educational level, starting with the Bologna declaration of 1999, which has been signed by 29 European Ministers of Education. They want to introduce a common framework for comparable degrees, following the concept of a bachelor and a masters degree. Clearly this change will have a great impact.

Let me end with the remark that the EMS is happy to see the strong activities of the Ukrainian mathematical community and its Mathematical Society in all of mathematics, pure and applied, and not to forget the important teaching of mathematics. This congress is the showpiece for these activities. I am sure you all will enjoy the lectures, as I will.
Thank you for your attention.

The life and scientific work of M. V. Ostrogradsky (born 1801)

Mykhailo Vasyliovych Ostrogradsky was born in Pashenna village (now Pashenivka) in Poltava region on 24 September 1801. His father and mother came from the Cossack families of Ostrogradsky and Sakhno-Ustimovich, well known since the 17th century. He studied at the Poltava gymnasium and the Kharkiv University (Department of Physics and Mathematics), from which he graduated with distinction in 1820 although did not get the diploma because of the intrigues of the reactionary officialdom that ruled in the university at that time. From 1822 to 1828 he continued his education in Paris, where he obtained significant scientific results.

Ostrogradsky's first scientific work, *The theory of waves in a vessel of cylindrical form* (written in the jail, for not having paid the apartment rent) was approved and published by the Paris Academy, and he was proposed a position in the Lycée Henri IV.

By the time Ostrogradsky came back to Russia, he was already a famous scientist. From 1828 he worked as a professor in the officer classes of the Naval College, followed by the Communications Engineering Institute (from 1832), the Central Engineering College (from 1840) and the Central Artillery College (from 1841).

He spent the summer holidays in Pashenna village working on his research. He died in Poltava on 1 January 1962 and, according to his will, was buried in Pashenna village, in his family's sepulchre.

M. V. Ostrogradsky occupies one of the most prominent places in the history of mathematical science. Extraordinary talent, a bold and brilliant mind, high mathematical erudition, and a good knowledge of the contemporary natural sciences permitted him to obtain results of great importance in many branches of mathematics and mechanics.

Ostrogradsky's scientific work was carried out during the first half of the 19th century, the period when mathematicians tremendously extended the scope of applications of their research, due to the success of the natural sciences. His research, too, was directed chiefly to the study of general laws of nature.

In his first work on the theory of heat, submitted to the St Petersburg Academy of Sciences in 1928, the young scientist had already proved the formula that connects the integral over a volume and the integral over the surface (the Ostrogradsky-Gauss formula). He was the first who understood the role of this formula and emphasised its importance throughout mathematics. One of the main achievements of this work is a formulation of the expansion of a function as a series in eigenfunctions of a differential operator, and this became the central problem in analysis for the whole century.

His work *A memoir on calculating variations of multiple integrals*, submitted to the St Petersburg Academy of Sciences in 1834, attracted a great deal of attention by contemporary mathematicians. The results obtained in this memoir laid foundations for the integral calculus of functions of many variables. These have long since become classical and are now the main tool in the theory of partial differential equations and the calculus of variations.

His series of works on the theory of integration of algebraic functions was a significant contribution to the theory of algebraic functions started by Abel, Gauss and Jacobi and, together with Liouville's works, had a significant influence on the subsequent development of the theory.

In addition to the above-mentioned works that contained a programme for his research, Ostrogradsky has many works related to the direct integration of concrete problems of mathematical physics, as well as to problems in algebra, special functions, geometry, probability theory and the calculation of integrals. Many theorems and formulas obtained by him became part of the standard curriculum in analysis and differential equations, although his name is not always mentioned.

A significant part of Ostrogradsky's works deals with analytical mechanics. He was fortunate to find, independently of the Irish scientist Hamilton, one of the fundamental principles in mechanics, the principle of least action, and to obtain a generalised dynamics equation that has numerous applications in modern physics, for studying the motion of particles, astronomy, etc. Not only did he solve many important general problems, he also found solutions of important particular problems in hydrostatics, hydrodynamics, elasticity theory, gravitation theory, ballistics, the theory of shocks and celestial mechanics. He is the author of fundamental material in celestial and analytic mechanics.

M. V. Ostrogradsky contributed to the development of the mathematical culture in Russia, so much so that it cannot be overestimated. He founded a school of Russian mathematicians who worked in mechanics and applied mathematics. Being a Full Member of the St Petersburg Academy of Sciences, Ostrogradsky was very popular as a lecturer. His public lectures helped to promote high ideas of science among Russian intellectuals, and in particular to extend the achievements of the French scientific school which was at the centre, at that time, of the mathematical ideas in which he was most interested. The French scientists Cauchy, Laplace, Poisson, Lamé, Poinsot and others had a very high opinion of Ostrogradsky's works. He was elected a corresponding member of the Paris Academy of Sciences, and a full member of the Rome, Turin and American academies.

There were many prominent scientists among Ostrogradsky's students: I. O. Vyshnegradsky, founder of automatic control theory; M. P. Petrov, founder of the theory of hydrodynamic friction, D. I. Zhuravsky, founder of the theory of calculations in bridge construction, and others. He wrote a number of textbooks and manuals. He also developed a fine system of teaching methodology, and he influenced publishing in Russia, in the middle of the 19th century, a number of textbooks that advocated progressive methods in teaching.

The ideas that come from the works of M. V. Ostrogradsky are topical in our time, too. They find new applications, first of all, in mathematical physics and theoretical physics, and in other branches of modern science.

ICIAM 2003 Update

from the Congress Director

October 2001

In previous updates, I described the processes for choosing the invited speakers for ICIAM 2003. Vitally important in this was the excellent work by the International Program Committee, ably chaired by Professor Ian Sloan.

We now take great pleasure in announcing the following 27 invited speakers for ICIAM 2003:

Brian Anderson, Australia	(systems, control and signal processing)
Marsha Berger, USA	(mesh generation, CFD, scientific computing)
Yann Brenier, France	(non-linear PDE)
Franco Brezzi, Italy	(finite element methods, engineering applications)
Jennifer Tour Chayes, USA	(statistical physics, Microsoft theory group)
Mark Davis, UK	(financial mathematics)
James Demmel, USA	(numerical linear algebra, simulation)
Peter Deuflhard, Germany	(modelling, simulation, optimisation)
David Donoho, USA	(mathematical statistics, wavelets, visualisation)
Yoshikazu Giga, Japan	(Navier-Stokes, non-linear PDE)
Alice Guionnet, France	(random interactions, probability, particle methods)
Tom Hou, USA	(multiscale and free boundary problems)
Jonathan Keating, UK	(dynamical systems, asymptotics, quantum chaos)
Rupert Klein, Germany	(CFD, modelling, combustion)
Nancy Kopell, USA	(dynamics of the nervous system, mathematical biology)
Tom Leighton, USA	(computer science, parallel algorithms, the net)
Peter A. Markowich, Austria	(semiconductors, kinetics, modelling)
Alexander Mielke, Germany	(non-linear PDE, dynamics, continuum mechanics)
Harald Niederreiter, Singapore	(quasi-Monte Carlo methods, discrete mathematics)
Michael Ortiz, USA	(solid mechanics, materials)
George Papanicolaou, USA	(waves, diffusion, multi-scale phenomena)
Neil Sloane, USA	(error correcting codes, integer sequences)
Philippe Toint, Belgium	(non-linear optimisation)
Ernie Tuck, Australia	(ship hydrodynamics, applied fluids)
Henk van der Vorst, Netherlands	(numerical linear algebra, iterative methods)
Ying Lung-an, China	(non-linear PDE, numerical methods)
Vladimir Zakharov, Russia/USA	(turbulence, integrable systems, kinetics)

Our webmaster, Dr Ross Moore, has constructed a lively and colourful page for each speaker and you are cordially invited to visit for an inspection. We hope you will agree the slate of speakers is an outstanding representation of modern industrial and applied mathematics.

Recent events in the USA might have raised doubts about the attractiveness of air travel to Australia. On that score, I'd like to reassure readers that Australia is a vibrant multicultural country in which peoples from approximately 150 countries live harmoniously. Australia has a long and cherished democratic tradition; indeed we are currently celebrating our 100 years of federation as a democratic nation. Terrorism is more remote to Australia than to most developed countries. Moreover, the local airlines have an excellent safety record.

It is now time to start making concrete plans to attend ICIAM 2003. If you wish to make some form of a presentation, then the principal vehicles to do this will be minisymposia, contributed presentations and poster presentations. Some details are already displayed on the web site www.iciam.org, and others will be added as deadlines and procedures become clearer.

But now is the time to make your plans. We look forward to giving you a warm Aussie welcome in July 2003.

Dr Noel Barton
Congress Director

Forthcoming conferences

Compiled by Kathleen Quinn

Please e-mail announcements of European conferences, workshops and mathematical meetings of interest to EMS members, to k.a.s.quinn@open.ac.uk. Announcements should be written in a style similar to those here, and sent as Microsoft Word files or as text files (but not as TeX input files). Space permitting, each announcement will appear in detail in the next issue of the Newsletter to go to press, and thereafter will be briefly noted in each new issue until the meeting takes place, with a reference to the issue in which the detailed announcement appeared.

January 2002

28-1 February: International Conference on Factorization, Singular Operators and Related Problems, Funchal, Madeira, Portugal
[dedicated to the 70th birthday of Professor Gueorguii Litvinchuk]
Programme committee: A. Antonevich (Belarussia), A. Boettcher (Germany), B. Bojarskii (Poland), R. Duduchava (Georgia), M. Kaashoek (Netherlands), N. Karapetiants (Russia), Yu. Karlovich (Mexico), V. Kokilashvili (Georgia), N. Krupnik (Israel), V. Mazya (Sweden), V. Rabinovich (Mexico), B. Silbermann (Germany), I. Simonenko (Russia), I. Spitkovsky (USA), N. Vasilevskii (Mexico)
Organising committee: Stefan Samko, Chairman (Algarve), Victor Kravchenko (Algarve), Jose Molarinho Carmo (Madeira), Jose Castanheira da Costa (Madeira), Rita Vasconcelos (Madeira), Antonio Ferreira dos Santos (Lisboa), Francisco Teixeira (Lisboa), Amarino B. Lebre (Lisboa), Ana Moura Santos (Lisboa)
Information: contact Prof. Dr Stefan Samko, Universidade do Algarve Faculdade de Ciencias e Tecnologia, Campus de Gambelas, Faro, 8000, Portugal
e-mail: ssamko@ualg.pt
Web site: http://www.digiways.com/fsorp/

February 2002

1-30 April: Special Research Trimester on Dynamical Systems, Pisa
Information:
Web site:
http://www.math.sns.it/degiorgi/dynsys/
[For details, see EMS Newsletter 41]
11-15: Neural Networks and Applications (NNA '02), Interlaken, Switzerland
Information:
Web site:
http://www.worldses.org/wses/calendar.htm
11-15: Fuzzy Sets and Fuzzy Systems (FSFS '02), Interlaken, Switzerland
Information:
Web site:
http://www.worldses.org/wses/calendar.htm
11-15: Evolutionary Computations (EC '02) Interlaken, Switzerland
Information:
Web site:
http://www.worldses.org/wses/calendar.htm

March 2002

18-19: Workshop on Under- and Over-determined Systems of Algebraic and Differential Equations, Karlsruhe, Germany
Information:
Web site: http://iaks-www.ira.uka.de/iaks-calmet/ ADE
[For details, see EMS Newsletter 41]
21-22: Eighth Rhine Workshop on Computer Algebra, Mannheim, Germany
Information:
Web site: http://www.uni-mannheim.de/RWCA
[For details, see EMS Newsletter 41]
26-4 April: International Centre for Mathematical Sciences EuroSummer School and Instructional Conference on Combinatorial Aspects of Mathematical Analysis, Edinburgh, UK
Information:
Web site:
www.ma.hw.ac.uk/icms/meetings/2002/cama February 2002
[For details, see EMS Newsletter 41]

April 2002

1-30 June: Trimester on Algebraic Topology, Barcelona, Spain
Topics: algebraic topology, especially some topics in modern homotopy theory, including homotopy finite group theory, functor calculus and model category structures
Main visitors: S. Dourlens, J. Greenlees, J. Grodal, N. Kitchloo, R. Levi, J. Moller, D. Notbohm, B. Oliver, P.-E. Parent, N. Strickland
Location: Centre de Recerca Matemàtica, Bellaterra

May 2002

13-17: 34th Journées de Statistique, Brussels and Louvain-la-Neuve, Belgium
Information:
Web site: www.stat.ucl.ac.be/JSBL2002
[For details, see EMS Newsletter 41]
15-17: Fourth International Conference on Advances in Fluid Mechanics, Ghent, Belgium
Aim: to provide a forum for the interchange of new ideas and the presentation of the latest work in the field. Work discussed will appear in future volumes of the book series *Advances in Fluid Mechanics*, the Editorial Board of which serves as the scientific advisory committee for the conference. The basic mathematical formulations of fluid mechanics and their computer modelling will be discussed, as well as the relationship between experimental and analytical results
Topics: experimental versus simulation methods, numerical methods in fluid mechanics, boundary element methods, fluid-structure interaction, convection, heat and mass transfer, hydrodynamics, coastal sea modelling, river, lake and estuary dynamics, wave modelling, multi-phase flow, acoustics, environmental fluid mechanics, high-performance computing in fluid mechanics, bio-fluids, material properties and fluids, industrial applications
Call for papers: papers are invited on the topics outlined and others falling within the scope of the meeting. Abstracts of no more than 300 words should be submitted to the conference secretariat, and should clearly state the purpose, results and conclusions of the work to be described in the final paper. Final acceptance will be based on the full-length paper, which if accepted, must be presented at the conference. Each submitted paper is subject to a separate registration
Programme committee: C.A. Brebbia (UK), M. Rahman (Canada), R. Verhoeven (Belgium)
Organising committee: A. Chakrabarti (India), G. Comini (Italy), L. Debnath (Florida), J.P. du Plessis (South Africa), M.M. El-Refaee (Kuwait), R.C. Gupta (Singapore), D.B. Ingham (Leeds), A. Jeffrey (Newcastle-upon-Tyne), A. Mendes (UK), T.B. Moodie (Canada), M.A. Noor (Canada), W. Perrie (Canada), H. Pina (Portugal), D. Prandle (UK), M.G. Satish (Canada), P. Skerget (Slovenia), P.A. Tyvand (Norway), L.C. Wrobel (Brunel)
Organisers: Wessex Institute of Technology and University of Ghent, Belgium
Proceedings: will be published in hard cover book form by WIT Press; available to delegates at the time of registration and widely distributed after the conference through the international book trade. Further details can be found at www.witpress.com
Location: the Cultural Centre of the Ghent University 'Het PAND', a former Dominican monastery, located in the historical center of the city, on the banks of the river Leie
Deadlines: for abstracts, as soon as possible; for papers, 18 December
Information: contact Stacey Hobbs, Conference Secretariat, AFM 2002, Wessex Institute of Technology, Ashurst Lodge, Ashurst Southampton SO40 7AA, UK,
tel: 44 (0) 238 029 3223, *fax*: 44 (0) 238 029 2853
e-mail: shobbs@wessex.ac.uk
Web site: http://www.wessex.ac.uk/conferences/2002/afm02/index.html
19-26: Symmetry and Perturbation Theory (SPT2002), Cala Gonone, Sardinia, Italy
Organisers: S. Abenda (Bologna), G. Gaeta (Milano and Roma), S. Walcher (Munich)
Information:
Web site:
http://web.tiscalinet.it/spt_spt/spt2002.html
22-24: Discrete Groups and Geometric Structures, with Applications (Crystallographic Groups and their Generalizations III), Kortrijk, Belgium
Main speakers: Y. Benoist (Paris), B. Farb (Chicago), D. Fried (Boston), F. Labourie (Orsay), A. Lubotzky (Jerusalem, to be confirmed), G. Soifer (Bar Ilan), R. Grigorchuk (Moscow)
Topics: recent developments concerning interactions between group theory and geometry, including geometric group theory, group actions on manifolds, crystallographic groups and generalisations (affine, polynomial, almost-crystallographic), discrete subgroups of Lie groups, graphs of groups; applications in and

beyond the fields mentioned
Programme committee: H. Abels (Bielefeld), Y. Felix (Louvain-la-Neuve), W. Goldman (College Park), F. Grunewald (Duesseldorf), P. Igodt (Leuven/Kortrijk), K.B. Lee (Norman, Oklahoma)
Organising committee: K. Dekimpe, P. Igodt, W. Malfait (all at Kortrijk), Y. Felix (Louvain-la-Neuve)
Programme: short communications and posters
Abstracts: should be sent to Paul.Igodt@kulak.ac.be
Sponsors: K.U. Leuven Campus Kortrijk, Fund for Scientific Research Flanders (Belgium), F.W.O. Scientific Research Network 'Fundamental methods and techniques in mathematics'
Location: K.U. Leuven Campus
Information:
e-mail: workshop@kulak.ac.be
Web site: http://www.kulak.ac.be/workshop

25-3: XXII International Seminar on Stability Problems for Stochastic Models (SPSM) and Seminar on Statistical Data Analysis (SDA), Varna, Bulgaria
Information:
Web site: http://stabil.fmi.uni-sofia.bg
[For details, see EMS Newsletter 41]

27-29: Spring School on Frobenius Manifolds in Mathematical Physics, Enschede, The Netherlands
Information:
e-mail: nijpjes@sci.kun.nl

27-31: 6th Congress of SIMAI (Italian Society for Applied and Industrial Mathematics), Chia, Island of Sardinia, Italy
Scope: applied mathematics and the applications of mathematics in technology, finance, medicine, environment and society
Main speakers: U. Barberis (Genoa), H. Berestycki (Paris), A. Murli (Naples), H. Ockendon (Oxford), R. Rannacher (Heidelberg)
Languages: English and Italian
Abstracts: in English, up to a maximum of 4 pages, should be sent to simai2002@iac.rm.cnr.it, indicating the type of presentation (invited, oral or poster; mini-symposium or focus session) in the subject line of the e-mail. The volume of abstracts and the Congress programme will be distributed at the registration desk. The format (Latex or Word) for the preparation of the abstracts can be downloaded from http://www.iac.rm.cnr.it/simai, by clicking on 'simai 2002'
Programme committee: U. Barberis (Genoa), V. Boffi (Rome), F. Brezzi (Pavia), E. De Bernardis (Rome), G. Fotia (Cagliari), N. Gomiero (Marano Ticino, NO), M. Primicerio (Florence; President), L. Puccio (Messina), V. Valente (Rome)
Organising committee: V. Boffi (Rome; President), N. Dessi (Cagliari), G. Fotia (Cagliari), M. Gaviano (Cagliari), F. Maggio (Cagliari), S. Seatzu (Cagliari; Vice-President), V. Valente (Rome)
Location: Congress Center at the Grand Hotel Chia, Laguna
Deadlines: for proposals of mini-symposia, focus sessions and round tables, 15 December; for all presentations (oral and poster communications; communications in the frame of mini-symposia and focus sessions; contents of round tables; invited lectures), 28 February
Information: contact organising secretariat: G. Castellini, SIMAI, c/o IAC/CNR - Viale del Policlinico, 137 - I-00161 Rome; *tel*. +39-06-88470213; *fax* +39-06-4404306; *e-mail*: castellini@iac.rm.cnr.it; or P. Rughetti, IAC/CNR - Viale del Policlinico, 137 - I-00161 Rome, *tel*. +39-06-88470249; *fax* +39-06-4404306; *e-mail*: rughetti@iac.rm.cnr.it
Web site: http://www.iac.rm.cnr.it/simai (click on 'simai 2002')

28-31: 2nd International Conference on Advanced Computational Methods in Engineering (ACOMEN 2002), Liège, Belgium
Theme: advanced numerical and computational methods, such as (adaptive) finite element, finite volume and finite difference methods, boundary element methods, spectral methods and domain decomposition techniques, applied to direct and inverse problems in the following themes: solid and structural mechanics, acoustics and vibration control, heat/mass transfer and phase change, environmental engineering, fluid flow and porous media, electric and magnetic fields, industrial topics, computational mathematics and simulation
Aim: to act as a forum for engineers and applied mathematicians, dealing with advanced numerical strategies, computational methods and simulation in various engineering disciplines
Invited speakers: C. Beckermann (Iowa), T. Belytschko (Illinois), A. Bossavit (France), M. Géradin (Belgium), K. Morgan (Wales), E. Onate (Spain, president of ECCOMAS), H. Van Brussel (Belgium), H. Van Duijn (Netherlands)
Organising committee: M. Hogge (Liège), H. De Schepper (Ghent), R. Van Keer (Ghent), E. Noldus (Ghent)
Location: Campus Sart Tilman, Liège University
Information:
e-mail: acomen@cage.rug.ac.be
Web site: http://cage.rug.ac.be/~acomen

June 2002

4-13: 3rd Linear Algebra Workshop BLED 2002, Bled, Slovenia
Information:
Web site: http://www.ijp.si/ftp/pub/STOp/law/
[For details, see EMS Newsletter 41]

5-9: Conference in Honour of Hans Wallin, Umea, Sweden
Information:
Web site: http://www.math.umu.se/aktuellt/HWkonferens.htm
[For details, see EMS Newsletter 41]

6-15: Fourth International Conference on Geometry, Integrability and Quantization, Varna, Bulgaria
Aim: to bring together experts in classical and modern differential geometry, complex analysis, mathematical physics and related fields, to assess recent developments in these areas and to stimulate research in related topics
Main speakers: A. Calini (curve geometry and soliton theory), G. Naber (equivariant localisation: exactness of the stationary phase approximation), R. Schmid (diffeomorphism, gauge and loop groups, Lie groups of pseudodifferential and Fourier integral operators), W. Zakrzewski (geometry of sigma models, to be confirmed)
Organising committee: Ivailo M. Mladenov (Sofia), Gregory L. Naber (Chico)
Advisory committee: P. Exner (Praha), M. de Gosson (Karlskrona), T. Iwai (Kyoto), R. Picken (Lisboa) and I. Vaisman (Haifa)
International Standing Committee: B. Konopelchenko (Lecce), M. de Leon (Madrid), A. Odzijewicz (Bialystok), H. Sato (Nagoya) and W. Schempp (Siegen)
Sponsors: Bulgarian Academy of Sciences, California State University Chico, European Mathematical Society
Proceedings: to be published by an internationally recognised scientific publisher. Proceedings of previous conferences can be found at http://coral.dir.bg/geom.htm
Fees: a nominal registration fee of $150 if paid through a bank transfer up to 31 March; this covers a copy of the proceedings and the organised activities. Later registration paid directly upon arrival is $200
Information:
e-mail: MLADENOV@BGCICT.ACAD.BG, GNABER@CSUCHICO.EDU
Web site: http://www.bio21.bas.bg/conference/

10-16: Aarhus Topology 2002, Aarhus, Denmark
Information:
Web site: http://www.imf.au.dk/AT2002/
[For details, see EMS Newsletter 41]

11-13: Third International Symposium on Remote Sensing of Urban Areas, Istanbul, Turkey
Topics: new observation sensors (systems) for urban monitoring, high spatial resolution satellite sensor data for urban applications, digital photogrammetric applications in urban areas, monitoring urban growth (trend analysis, change detection), differentiation of the inner parts of cities, creating urban digital elevation models, GIS/GPS technology for urban applications, urban management systems, hydrological/geological assessment of urban areas, meteorological/ecological assessment of urban areas, national and international projects using remote sensing and GIS, ecological (urban) risk analysis in urban areas using remote sensing, remote sensing and GIS for historical/archeological applications, rural applications (natural resource management systems), using remote sensing and GIS for sustainable urban development, digital/virtual city models and GIS based traffic management, radar remote sensing of urban areas, thermal infra-red remote sensing of urban areas, remote sensing of urban vegetation, remote sensing of contaminated land in urban areas
Organising committee: Derya Maktav (Istanbul, Chair), Carsten Jürgens (Regensburg, Co-chair), Filiz Sunar Erbek (Istanbul), Farouk El-Baz (Boston), Garik Gutman (NASA), Manfred Ehlers (Vechta), Ediz Hun (President, Environment Commission, Turkey), Orhan Altan (Istanbul), Hasan Akgün (Büyükçekmece Municipality, Turkey), Arnon Karnieli (Ben Gurion University), Robert Laurini (Lyon)
Deadline: for abstract submission, 15 December
Information: contact Prof. Dr. Derya Maktav (Symposium Chair), Istanbul Technical University, Department of Remote Sensing; *e-mail*: dmaktav@ins.itu.edu.tr; Carsten Jürgens,(Co-chair), Regensburg University, Department of Geography; *e-mail*: carsten.juergens@geographie.uni-regensburg.de; or, for general correspondence, inquiries and submission of papers, Filiz Sunar Erbek, Ýstanbul Teknik Üniversitesi, Ýnþaat Fakültesi, 80626 Maslak, Istanbul, Turkey; *tel*: 0090-0212-

2853801; *fax*:0090-0212-5737027; *e-mail*: fsunar@srv.ins.itu.edu.tr
Web site: http://www.ins.itu.edu.tr/deryamaktav

17-19: 24th World Conference on Boundary Element Methods incorporating Meshless Solutions Seminar Sintra, Portugal
Scope: the internationally recognised forum for disseminating the latest boundary element method and its applications. BEM is a very active area of research with the method being successfully applied to solve difficult engineering and scientific problems. This includes the solution of non-linear and time-dependent problems. Considerable advances have also been made in the solution of complex fluid dynamic problems and the use of high performance computing. The conference will deal with the topics listed, as well as papers of a more theoretical character. State-of-the-art reviews and advanced mathematical and computational aspects will also be discussed
Special feature: seminar on meshless methods, which will discuss the use of integral equations without meshes. Many techniques will be highlighted including, fundamental solutions, Galerkin, diffuse methods, localised collocation, cloud and diffusive methods and modified Trefftz techniques
Topics: dynamics and vibrations, fracture mechanics and fatigue, inelastic problems, composite materials, plates and shells, contact mechanics, geomechanics, material processing and metal forming, soil and soil structure problems, electrostatics and electromagnetics, biomechanics, inverse problems, fluid flow, interfacial and free surface flow, transport problems, wave propagation problems, acoustics, dual reciprocity method and basis functions, fundamental principles, computational techniques, advanced formulations, sensitivity analysis and optimization, meshless methods seminar, fundamental solution method, source-field superposition, diffuse methods, local meshless methods, modified Trefftz methods, natural element methods, charge simulation methods, element-free Galerkin, cloud methods, point collection methods
Call for papers: papers are invited on the topics outlined and others falling within the scope of the meeting. Abstracts of no more than 300 words should be submitted to the conference secretariat, and should clearly state the purpose, results and conclusions of the work to be described in the final paper. Final acceptance will be based on the full-length paper, which if accepted, must be presented at the conference. Each submitted paper is subject to a separate registration
Programme committee: G. Beer (Austria), M.B. Bush (Australia), C.Y. Cha (USA), C.S. Chen (USA), A.H.-D. Cheng (USA), G. De Mey (Belgium), V. DeGiorgi (USA), N.A. Dumont (Brazil), A. El-Zafrany (UK), L. Gaul (Germany), G.S. Gipson (USA), M.A. Golberg (USA), L. Gray (USA), S. Grilli (USA), K. Hayami (Japan), M.S. Ingber (USA), D.B. Ingham (Leeds), N. Kamiya (Japan), D.L Karabalis (Greece), A.J. Kassab (USA), J.T. Katsikadelis (Greece), E. Kita (Japan), W.J. Mansur (Brazil), S. Mukherjee (USA), K. Onishi (Japan), F. Paris (Spain), H. Power (Nottingham), P. Prochazka (Czech Republic), J.J. Rencis (USA), T.J. Rudolphi (USA), B. Sarler (Slovenia), E. Schnack (Germany), A.P. Selvadurai (Canada), L. Skerget (Slovenia), V. Sladek (Slovakia), S. Syngellakis (Southampton), Masa Tanaka (Japan), N. Tosaka (Japan), T. Tran-Cong (Australia), W.S. Venturini (Brazil), O. von Estorff (Germany), L.C. Wrobel (Brunel), T. Wu (USA)
Organisers: Wessex Institute of Technology, UK and University of Coimbra, Portugal
Organising committee: C.A. Brebbia (UK), A. Tadeu (Portugal), V. Popov (UK)
Sponsors: International Society of Boundary Elements (ISBE), International Journal of Engineering Analysis with Boundary Elements
Proceedings: will be published in hard cover book form by WIT Press; available to delegates at the time of registration, and widely distributed after the conference through the international book trade
Deadlines: for abstracts, as soon as possible; for papers, 15 January
Information: contact Rachel Green, Conference Secretariat, BEM 24, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK;
tel: 44 (0) 238 029 3223; *fax*: 44 (0) 238 029 2853
e-mail: rgreen@wessex.ac.uk
Web site: http://www

17-21: Seventh International Conference on *p*-adic Functional Analysis, University of Nijmegen, The Netherlands
Scope: analysis over valued fields other than the real or complex numbers (such as the *p*-adic number field or Krull valued fields). The main mathematics subject classifications are 46S10, 47S10, 32P05, 26E30
Scientific committee: W. Schikhof (Nijmegen, Netherlands), A. Escassut (Clermont Ferrand, France), C. Perez-Garcia (Santander, Spain)
Speakers (preliminary list): J. Araujo, J.M. Bayod, M. Berz, A. Boutabaa, B. Diarra, A. Escassut, N. De Grande-De Kimpe, L. Van Hamme, J. Kakol, A. Katsaras, H. Keller, A. Khrennikov, A. Kochubei, A. Lemin, H. Ochsenius, C. Perez-Garcia, Dinamerico Pombo jr, S. Priess, P. Ribenboim, A. Salinier, W. Schikhof, N. Shell, W. Sliwa, S. Vega
Information:
e-mail: schikhof@sci.kun.nl
Web site: http://www.sci.kun.nl/math/p-adic2002/

17-21: XVth Householder Symposium on Numerical Linear Algebra, Peebles, Scotland
Theme: numerical linear algebra
Call for papers: see web site
Programme committee: N. Higham (Manchester, Chair), A. Bunse-Gerstner (Bremen), T. Chan (Los Angeles), C. Davis (Toronto), D. O'Leary (Maryland), M. Overton (Courant Institute), G.W. Stewart (Maryland), H. van der Vorst (Utrecht), P. Van Dooren (Louvain-la-Neuve), C. Van Loan (Cornell)
Organising committee: P. Knight (Strathclyde), A. Ramage (Strathclyde), A. Wathen (Oxford)
Location: Peebles Hotel Hydro, Peebles, Scotland
Grants: support available for students and others with limited access to other funding
Notes: the 11th Householder Prize for the best thesis in numerical algebra written since 1 January 1999 will be awarded at the meeting
Deadline: for abstracts, 11 December
Information:
e-mail: alison@maths.strath.ac.uk
Web site:
http://www.maths.strath.ac.uk/~matrix/

17-22: School on Population Dynamics, Bedlêwo, Poland
Scope: organised within the EU Programme Centre of Excellence coordinated by the Stefan Banach International Mathematical Centre through the Package 'Mathematical Modelling and Analysis of Cellular Populations'
Theme: mathematical theory and methods applied to study populations of entities, including cells, genes, and biomolecules
Topics: adaptive dynamics, ecology, epidemiology, physiology, structured populations dynamics
Programme: main courses: O. Arino (France), ecology; O. Diekmann, adaptive dynamics; M. Iannelli (Italy), epidemiology; M.C. Mackey (Canada), physiology; G.F. Webb (USA), structured populations dynamics. There will also be a series of one-hour lectures given by members of the scientific committee and 15 min. communications by participants
Programme committee: O. Arino (France), O. Diekmann (The Netherlands), M. Kimmel (USA), A. Lasota (Poland), M.C. Mackey (Canada), P.K. Maini (UK), F. Przytycki (Main Coordinator of the Project of Centre of Excellence, Poland), R. Rudnicki (Coordinator of the Package, Poland), Z. Taib (Sweden)
Organising committee: T. Kulpa (Poland), K. Pichór (Poland), R. Rudnicki (Chair, Poland), M. Tyran-Kamiñska (Poland)
Sponsors: European Commission, Polish State Committee for Scientific Research, Institute of Mathematics Polish Academy of Sciences, University of Silesia
Location: Mathematical Conference Centre, a palace complex in Bedlêwo
Grants: possible reduction of fee for a limited number of participants
Deadlines: for financial support, 20 January; for registration, 20 April
Information:
e-mail: cmmpd@ux1.math.us.edu.pl
Web site: http://www.math.us.edu.pl/cmmpd/

18-22: Barcelona Conference on Stochastic Inequalities and their Applications (EuroConference), Bellaterra, Barcelona, Spain
Scientific committee: E. Giné, Ch. Houdré and D. Nualart
Organising committee: D. Nualart, F. Utzet, A. Kohatsu and M. Jolis
Information:
Web site: http://www.crm.es/stochineq

24-28: Conference on Mathematical Modelling of Population Dynamics, Bêdlewo, Poland
Scope: organised within the EU Programme Centre of Excellence coordinated by the Stefan Banach International Mathematical Centre through the Package 'Mathematical Modelling and Analysis of Cellular Populations'
Topics: the focus will be on mathematical modelling and model analysis of populations at various levels, including cells, genes, biomolecules and of population dynamics in the following broad themes: ecology, epidemiology and infectious diseases, evolution, immunology and cancer growth, physiology
Main speakers: U. An der Heiden (Germany), P. Auger (France), K.-P. Hadeler (Germany), K. Sigmund (Austria), H.R. Thieme (USA).
Programme committee: O. Arino (France), O. Diekmann (Netherlands), M. Kimmel (USA), A. Lasota (Poland), M.C. Mackey (Canada), P.K.

Maini (UK), F. Przytycki (Main Coordinator of the Project of Centre of Excellence, Poland), R. Rudnicki (Coordinator of the Package, Poland), Z. Taib (Sweden)
Organising committee: T. Kulpa (Poland), K. Pichór (Poland), R. Rudnicki (Chair, Poland), M. Tyran-Kamiñska (Poland)
Sponsors: European Commission, Polish State Committee for Scientific Research, Institute of Mathematics Polish Academy of Sciences, University of Silesia
Proceedings: to be published in Banach Center Publications
Location: Mathematical Conference Centre, a palace complex in Bêdlewo
Grants: possible reduction of fee for a limited number of participants, especially for PhD students and young researchers
Deadlines: for financial support, 20 January; for registration, 20 April
Information:
e-mail: cmmpd@ux1.math.us.edu.pl
Web site: http://www.math.us.edu.pl/cmmpd/

27- 3 July: Fifth International Conference on Curves and Surfaces, Saint-Malo, France
Information:
e-mail: saint-malo@imag
Web site: http://www-lmc.imag.fr/saint-malo/

July 2002

1-6: Advanced Course on Mathematical Finance: Models, Bellaterra, Barcelona, Spain
Coordinator: Joan del Castillo
Information:
Web site: http://www.crm.es/matfin

1-6: 2nd International Conference on the Teaching of Mathematics at Undergraduate Level, Chersonissos, Crete, Greece
Topics: educational research, technology, innovative teaching methods, curricula innovations, preparation of teachers, mathematics and other disciplines, distance learning
Main speakers: Hyman Bass (USA), Deborah Ball (USA), Jean-Pierre Bourguignon, (France), Miguel De Guzman (Spain), Peter Galbraith (Australia), Oh Nam Kwon (Korea), Joanna Mamona-Downs (Greece), Verdiana Masanja (Tanzania), Alan Schoenfeld (USA), Man Keung Siu (Hong Kong, China), David Smith (USA), Tosun Terzioglu (Turkey)
Call for papers: abstracts for paper or poster presentation should be submitted; authors of proposals accepted for paper presentation may submit an article for inclusion in the proceedings. Full papers will be reviewed by members of the international programme committee. The proceedings will be published by J. Wiley Inc. and available at the conference. See below for deadlines
International programme committee: I. Vakalis (USA; Chair), D. Hughes-Hallett (USA; Co-chair), Ch. Kourouniotis (Greece; Co-chair), C. Tzanakis (Greece; Co-chair), M. Abboud (Lebanon), A. Arcavi (Israel), H. Arikan (Turkey), M. Artigue (France), G. Baker (USA), E. Barbin (France), W. Barker (USA), J. Belward (Australia), B. Blyth (Australia), R. Borelli (USA), P. Cretchley (Australia), F. Demana (USA), J. Engelbrecht (South Africa), Y. Ersoy (Turkey), V. Farmaki (Greece), F. Furinghetti (Italy), E. Gavosto (USA), A. Gleason (USA), N. Hadjisavvas (Greece), C. Hatzikyriakou (Greece), H-W. Henn (Germany), D. Holton (New Zealand), M. Isoda (Japan), C. Julie (South Africa), F. Kalavassis (Greece), U. Kirchgraber (Switzerland), M. Kourkoulos (Greece), E. Koleza (Greece), B. Kutzler (Austria), Th. Kyriazis (Greece), C. Laborde (France), M. Lambrou (Greece), Ch. Lemonidis (Greece), J. van Maanen (Holland), W. McCallum (USA), M. Majewski (United Arab Emirates), V. Makrakis (Greece), J. Mamona-Downs (Greece), S. Negrepontis (Greece), B. Osgood (USA), P. Pamfilos (Greece), S. Papastavridis (Greece), T. Patronis (Greece), M. Petrakis (Greece), J.D. Phillips (USA), D. Potari (Greece), D. Quinney (UK), A. Radunskaya (USA), Ch. Sakonidis (Greece), G. Schubring (Germany), M-K. Siu (China), J. Uhl (USA), B. Waits (USA), T. Wang (USA), L-P. Yee (Singapore), Th. Zachariades (Greece)
Academic sponsors (provisional): Bowdoin College, Capital University, Duke University, ETH-Zurich, Ewha Womans University, Franklin University, Harvey Mudd College, Middle East Technical University, Pomona College, Project Kaleidoscope, Stanford University, Ohio State University, Université Paris 7 Denis Diderot, University of Arizona, University of Athens, University of Crete, University of Southern Queensland, John Wiley and Sons Inc.
Location: Conference Centre of Knossos Royal Village, Hersonissos, Crete, Greece
Grants: probably support for participants from countries in a difficult economic situation and young mathematicians
Deadlines: for early registration, 31 January; for abstracts, already passed; for full papers 30 January
Information:
e-mail: ivakalis@capital.edu, chrisk@math.uoc.gr, tzanakis@edc.uoc.gr
Web site: http://www.math.uoc.gr/~ictm2

2-6: 2002 Barcelona Conference on Algebraic Topology (EuroConference), Barcelona, Spain
Scientific committee: C. Broto, C. Casacuberta, H. Miller
Organising committee: J. Aguadé, C. Casacuberta
Information:
Web site: http://www.crm.es/2002bcat

15-18: Modular Curves and Abelian Varieties (EuroConference), Bellaterra, Barcelona, Spain
Coordinator: J. Quer
Information:
Web site: http://www.crm.es/mcav02

16-22: 7th International Spring School: Nonlinear Analysis, Function Spaces and Applications (NAFSA 7), Prague, Czech Republic
Information:
Web site: http://www.math.cas.cz/~nafsa7
[For details, see EMS Newsletter 40]

August 2002

3-10: Logic Colloquium 2002 (ASL European Summer Meeting), Münster, Germany
Information:
Web site: http://www.math.uni-muenster.de/LC2002/
[For details, see EMS Newsletter 41]

5-9: International Conference on Ill-Posed and Inverse Problems, Novosibirsk, Russia
[in honour of the 70th anniversary of the birth of Prof. M.M. Lavrent'ev]
Theme: ill-posed problems, inverse problems, tomography and other imaging modalities, numerical analysis and applications
Call for papers; registration: see web site
Programme committee: V.G. Romanov (Russia), Yu.E. Anikonov (Russia), M.I. Belishev (Russia), Yu.Ya. Belov (Russia), A.L. Bukhgeim (Russia), G. Chavent (France), D. Colton (USA), A.M. Denisov (Russia), H.W. Engl (Austria), A.M. Fedotov (Russia), Y. Iso (Japan), S.I. Kabanikhin (Russia), O.A. Klimenko (Russia), R. Kress (Germany), M.M. Lavrent'ev (jr.) (Russia), A. Lorenzi (Italy), B.A. Mair (USA), G.I. Marchuk (Russia), Z. Nashed (USA), V.V. Pickalov (Russia), P. Sabatier (France), O. Scherzer (Germany), S.I. Smagin (Russia), V.N. Strahov (Russia), Y.M. Sultangazin (Kazakhstan), J. Sylvester (USA), G. Uhlmann (USA), V.V. Vasin (Russia), A.G. Yagola (Russia), Sh. Yarmukhamedov (Uzbekistan)
Sponsors: Sobolev Institute of Mathematics, Novosibirsk State University, Krasnoyarsk State University, Russia Foundation for Basic Research
Deadlines: for preregistration, 31 December; for abstracts, 31 May
Information:
e-mail: mml@math.nsc.ru
Web site: www.math.nsc.ru/conference/mml

10-11: Colloquium Logicum 2002, Münster, Germany
[satellite conference of Logic Colloquium 2002]
Information:
Web site: http://wwwmath.uni-muenster.de/LC2002/
[For details, see EMS Newsletter 41]

25-30: Wireless And Optical Communications (WOC '02), Miedzyzdroje, Poland
Information:
Web site: http://www.worldses.org/wses/calendar.htm

25-30: Nanoelectronics, Nanotechnologies (NN '02), Miedzyzdroje, Poland
Information:
Web site: http://www.worldses.org/wses/calendar.htm

September 2002

3-7: 8th International Conference on Stability, Control and Rigid Bodies Dynamics, Donetsk, Ukraine
Theme: problems of general mechanics, stability and control theories
Topics: stability theory, control in dynamical systems, dynamics of rigid body and of multi-body systems, methods of rigid body dynamics in the theory of elasticity
Main speakers: A. Agrachev (Russia), L. Chua (USA), C. Corduneanu (USA), A. Fradkov (Russia), B. Jakubczyk (Poland), W. Respondek (France), V. Rumyantsev (Russia), H. Troger (Austria), S. Vasilyev (Russia)
Languages: Ukrainian, Russian, English
Programme: 45-minute invited plenary lectures, 30-minute section lectures, short presentations (15-minute communications and posters)
Call for papers: abstracts (up to 1 page, in TeX) should be submitted by e-mail
Programme committee: A. Agrachev (Russia), F. Chernousko (Russia), L. Chua (USA), C.

Corduneanu (USA), M. Fliess (France), A. Fradkov (Russia), L. Hatvani (Hungary), B. Jakubczyk (Poland), D. Klimov (Russia), V. Kuntsevich (Ukraine), V. Koshlyakov (Ukraine), I. Lukovskii (Ukraine), G. Liu (China), V. Matrosov (Rusiia), K. Peiffer (Belgium), F. Pfeiffer (Germany), W. Respondek (France), V. Rumyantsev (Russia), A. Savchenko (Ukraine), W. Schiehlen (Germany), V. Shevchenko (Ukraine), V. Storozhev (Ukraine), H. Troger (Austria), S. Vasilyev (Russia), V. Vujichich (Yugoslavia)
Organising committee: A. Kovalev (Chair, Institute of Applied Mathematics and Mechanics of the National Academy of Sciences of Ukraine), A. Stupin (Co-chair, Donetsk National University), B. Konosevich (secretary, IAMM NASU)
Proceedings: on presentation of the programme committee, selected proceedings to be published in scientific journals
Location: the boarding-house of Donetsk National University on the Azov sea coast
Deadlines: for pre-registration, 31 January; for abstracts, 31 May
Information:
e-mail: konos@iamm.ac.donetsk.ua
Web site:
http://www.iamm.ac.donetsk.ua/conf2002.html

4-7: International Conference on Dynamical Methods for Differential Equations, Valladolid, Spain
Information:
Web site: http://wmatem.eis.uva.es/~dmde02/
[For details, see EMS Newsletter 41]

8-13: ALGORITMY 2002, Conference on Scientific Computing, High Tatra Mountains, Podbanske, Slovakia
Theme: applied mathematics, numerical methods, computational science and visualisation
Scope: computational realisations and analysis of algorithms solving real problems from all branches of sciences, engineering, technology, medicine, finance and other applications
Topics: computational fluid dynamics, non-linear heat and mass transfer, modelling of flow in porous media, image processing and computer vision, data analysis and pattern recognition, computational finance, free boundary problems, inverse problems, scientific visualisation, software for scientific computations
Main speakers: A. Bourlioux (Montreal), F. Cao (Paris), R. Eymard (Paris), M. Falcone (Rome), P. Frolkovic (Heidelberg/Bratislava), J. Fuhrmann (Berlin), M. Gander (Montreal) R. van Keer (Ghent), M. Lukacova-Medvidova (Brno), M. Ohlberger (Freiburg), M. Rumpf (Duisburg), A. Schmidt (Bremen), J.A. Sethian (Berkeley), G. Wittum (Heidelberg)
Programme: invited plenary lectures, 25-minutes contributed talks, poster session
Call for papers: refereed conference proceedings of contributed lectures will be published before the conference. Papers related to the topics of the conference are invited (previous issues are at http://www.iam.fmph.uniba.sk/amuc/_vol70n1.html). Proceedings of plenary lectures and selected papers of participants will appear after the conference in the Springer-Verlag journal *Computing and Visualization in Science*
Programme committee: E. Baensch (Berlin), P. Brunovsky (Bratislava), G. Dziuk (Freiburg), W. Jaeger (Heidelberg), J. Kacur (Bratislava), J. Komornik (Bratislava), G. Meyer (Atlanta), K. Mikula (Bratislava), M. Rumpf (Duisburg), J.A. Sethian (Berkeley), M. Vajtersic (Bratislava), G. Wittum (Heidelberg)
Organising committee: A. Handlovicova, M. Komornikova, Z. Kriva, K. Mikula, P. Struk, D. Sevcovic, M. Stevulova
Location: Hotel Permon, Podbanske
Deadlines: preliminary registration, 31 December; submission to proceedings, 30 April; registration, 31 May; payment, 31 May (regular conference fee); final submission of revised version to proceedings, 21 June; late registration, 15 August; final payment, 15 August (late conference fee)
Information:
Web site: http://www.math.sk/alg2002
e-mail: algoritm@vox.svf.stuba.sk

10-20: Advanced Course on Geometric 3-Manifolds, Bellaterra, Barcelona, Spain
Coordinator: Joan Porti
Information:
Web site: http://www.crm.es/geom-mani

20-25: International Conference on Computational Methods in Science and Engineering (CMMSE-2002), Alicante, Spain
Theme: numerical analysis, computational physics, computational chemistry
Topics: celestial mechanics, computational chemistry and physics, computational engineering, computational mathematics, computational statistics, high-performance computing, industrial mathematics, mathematical economics and finance, mathematical models for the information society
Chairs: J.M. Ferrandiz (Spain), D.L. Richardson (USA) (celestial mechanics), E. Brandas (Sweden), D. Truhlar (USA), D. Belkic (Sweden) (computational chemistry and physics), K.J. Bathe (USA), R. Lewis (UK) (computational engineering), J. Butcher (New Zealand), D.J. Higham (UK), T. Simos (Greece), J. Xu (USA) (computational mathematics), M.J. Bayarri (Spain) (computational statistics), H. Arabnia (USA), C.J.K. Tan (Canada) (high performance computing), C. Dawson (USA) (industrial mathematics), M. Ojeda (Spain), P. Vojtás (Eslovaquia) (mathematical models for the information society)
Proceedings: selected papers will appear in several special issues of the *Journal of Computational and Applied Mathematics* (www.elsevier.nl/inca/publications/), and the *Journal of Computational Methods in the Sciences and Engineering* (www.demon.co.uk/cambsci/jcmse.html)
Location: University of Alicante, Spain
Deadline: for abstracts, 15 December
Information:
e-mail: cmmse2002@ua.es
Web site: www.ua.es/cmmse2002/

23-27: Ramification in Arithmetic and Geometry, Paris, France
Organisers: A. Abbes (Paris), B. Erez (Bordeaux), T. Saito (Tokyo)
Location: Institut Galilee, Universite Paris 13
Information:
http://www-math.math.univ-paris13.fr/~ramifica/

October 2002

9-11: 7th Conference on Shell Structures, Theory and Applications (SSTA2002), Gdañsk-Jurata, Poland
Aim: to bring together scientists, designers, engineers and other specialists in shell structures in order to discuss important results and new ideas in this field of activity
Topics: theory and analysis of shells (linear and non-linear theory, constitutive laws, shells and plates with internal microstructure, hybrid and branched structures, beam-shell interaction, stability, dynamics, optimisation, reliability, sensitivity, limit load analysis); numerical analysis of shell structures and elements (computer methods, analysis of non-standard problems, development of software packages); design and maintenance of shell structures (industrial applications in civil, power, mining and mechanical engineering, and in the automotive, shipbuilding, aerospace and chemical processing industries, shell design codes and procedures (e.g. Eurocode), case studies of various shell structures and failure problems)
Programme: general lectures and contributed papers presented as lectures
Languages: English and Polish
Scientific committee: Wojciech Pietraszkiewicz (chairman), Jan Awrejcewicz, Jacek Chróœcielewski, Micha³ Kleiber, Pawe³ K³osowski, Piotr Konderla, Marian Królak, Tomasz Lewiñski, Czes³aw Szymczak, Krzysztof Wiœniewski, Roœcis³aw Tribi³o, Zenon Waszczyszyn, Czes³aw WoŸniak, Jerzy Zió³ko
Organising committee: Department of Structural Mechanics, Faculty of Civil Engineering, Technical University of Gdañsk, Poland
Proceedings: accepted abstracts (2 pages) will be included in the conference book of abstracts, available for the participants at registration. Full-length manuscripts of selected papers will be further considered for publication in a special volume of a recognised technical journal
Location: Hotel Neptun in the leisure region of the Hel Peninsula on the Baltic Sea (http:\\www.hotelneptun.gda.pl)
Grants: a limited number of fellowships for distinctive young researchers (less than 35 years old) from Eastern Europe, to cover participation in the Conference but not travel
Fees: registration fee, which covers full-board accommodation and the book of abstracts, is approximately $300 US; $250 US for accompanying persons
Deadlines: for pre-registration, 31 December; for submission of 2-page abstracts, 30 April
Information: contact SSTA2002 Organising Committee, Department of Structural Mechanics, Faculty of Civil Engineering, Technical University of Gdañsk, G.Narutowicza 11/12, 80-952, Gdañsk, Poland; *tel*: +48-58-347-21-47; *fax*: +48-58-347-16-70
e-mail: ssta2002@pg.gda.pl
Web site: http://www.pg.gda.pl/ssta2002

February 2003

5-7: 4th IMACS Symposium on Mathematical Modelling, Vienna, Austria
Information:
Web site:
http://simtech.tuwien.ac.at/MATHMOD
[For details, see EMS Newsletter 41]

Recent books

edited by Ivan Netuka and Vladimír Souček

Books submitted for review should be sent to the following address:
Ivan Netuka, MÚUK, Sokolovská 83, 186 75 Praha 8, Czech Republic.

S. Abbott, *Understanding Analysis*, *Undergraduate Texts in Mathematics, Springer, Berlin, 2001, 257 pp., DM 79, ISBN 0-387-95060-5*
This book aims to build up the elements of analysis properly – that is, with a good level of understanding. It contains fundamental results on real numbers, limits and continuity, differentiation, sequences, sums of functions and the Riemann integral. In many places, the book could be used for an introductory analysis course. In others, the material presented in the text would be appropriate after a calculus course. The author's intention was 'to restore intellectual liveliness of the course by offering to beginning students access to some truly significant achievements of the subject'. In other words, he tries to present relatively advanced topics in an accessible way, and thus make the course interesting and worthy of effort.

Among the topics treated in the book are completeness of the reals, double summation and products of series, Baire's theorem, continuity of derivatives, a continuous nowhere-differentiable function (Takagi approach) and Lebesgue's criterion for Riemann integrability. In the last chapter, the author shows that for the generalised Riemann integral all derivatives are integrable, and that the set of continuous functions on a compact interval I, differentiable at least at a point, is of the first category in $C(I)$, and presents basic results on Fourier series.

This book will be useful for gifted students for supplementary reading to a basic analysis course or for students not specialising in mathematics who wish to put this material on a solid basis. (jive)

E. M. Alfsen and F. W. Shultz, *State Spaces of Operator Algebras. Basic Theory, Orientations and C*-products*, *Mathematics: Theory and Applications, Birkhäuser, Boston, 2001, 350 pp., DM 170, ISBN 0-8176-3890-3 and 3-7643-3890-3*
This monograph is devoted to the theory of state spaces of C^*-algebras and von Neumann algebras and their geometry. The states determine representations of the algebra, and its algebraic stucture is encoded in the geometry of the state space. The theory of operator algebras has wide applications to physics, and there have recently been applications to various fields of pure mathematics (foliations and knot theory, Banach manifolds and infinite-dimensional holomorphy).

The introduction includes convexity, ordered vector spaces and ordered algebras, elementary dimension theory in lattices, algebras with involution and order derivation. A self-contained elementary introduction to C^*-algebras and von Neumann algebras is presented in Chapter 2. The next chapter presents the duality of the ideal structure of C^*-algebras and von Neumann algebras and the facial structure of the state space; this chapter also includes an order-theoretic characterisation of compressions. Chapter 4 is devoted to the normal state space of the algebra of all bounded operators on a Hilbert space, explaining also how it can be inscribed in a Euclidean ball and how its lattice of faces corresponds to the Grassmannian. Chapter 5 concerns states, representations and orientations of C^*-algebras. The next chapter surveys the elements of structure theory and continues with a study of symmetries and reflections in von Neumann algebras. Orientations and von Neumann algebras form the final chapter.

This volume contains complete proofs of basic results and commentaries on advanced topics of independent interest with references to the literature, and a discussion of applications to physics. The monograph is designed for experts in operator algebras, as well as for graduate students and researchers interested in the field. It can also serve as a quick introduction to C^*-algebras and von Neumann algebras for any mathematician who wants to learn the subject. The book is understandable with a basic knowledge of real and complex analysis, measure theory and functional analysis, and spectral theory. (jl)

J. W. Anderson, *Hyperbolic Geometry*, *Springer Undergraduate Mathematics Series, Springer, London, 1999, 230 pp., DM 59, ISBN 1-85233-156-9*
This textbook is an introduction to non-Euclidean geometry designed for undergraduate students. It is based mainly on the Poincaré half-plane model, and is written in a very understandable way; with only elementary knowledge needed for its reading.

In Chapter 1, the author defines the Poincaré model and its points and lines. In the next chapter, the group of transformations preserving the system of lines is carefully studied. Chapter 3 introduces the metric properties of geometry as invariants of this group, and Chapter 4 briefly exposes the possibility of getting new models by transferring the half-plane geometry by diffeomorphisms. In Chapter 5, convexity, area and trigonometry are studied and the Gauss-Bonnet Formula is proved. Chapter 6 presents the discrete subgroups of the group of motions.

The book is well structured. Each individual chapter concludes with exercises that are substantial for understanding what follows. The typography of the book is not ideal and the notation is a bit complicated. The topic of the book is very geometrical, and more pictures could have been expected. In particular, many of the computations could be nicely complemented by pictures appealing to geometrical intuition. Despite these remarks, the textbook is a good and useful introduction to hyperbolic geometry, and can be recommended for undergraduate courses. (zs)

D. H. Armitage and S. J. Gardiner, *Classical Potential Theory,* *Springer Monographs in Mathematics, 2001, 333 pp., DM 159, ISBN 1-85233-618-8*
Over the past century, the potential theory of Laplace's equation (classical potential theory) has undergone its most outstanding and rapid development. Everybody working in new branches of potential theory (non-linear theories, probabilistic and axiomatic approaches to potential theory, pluripotential theory, functions of one or more complex variables, etc.) should benefit from the knowledge of classical theory. There are brilliant textbooks and monographs on potential theory, such as those of Brelot, Helms, Doob, Landkof. The book by Armitage and Gardiner follows the most classical text of Helms and complements it with new results and approaches.

The first chapter introduces and summarises the main properties of harmonic functions (Laplace's equation, mean value properties, convergence properties, the Kelvin transform, the Poisson integral and Harnack's inequalities). There follows a chapter on harmonic polynomials. Elementary properties and new results concerning subharmonic functions are described in Chapter 3 (approximation of subharmonic functions by smooth ones, convexity and subharmonicity and harmonic majorants). The next chapters are devoted to a penetrating study of potentials (Green functions, the Riesz decomposition, the distributional Laplacian, classical boundary limit theorems), polar sets and capacity (removable singularities, reduced functions, Choquet capacitability theorem, logarithmic capacity, Hausdorff measure and capacity) and the classical Dirichlet problem (Perron-Wiener-Brelot solutions, harmonic measure, negligible sets, superharmonic extension). The final three chapters are deeper and introduce topological concepts from potential theory: the fine topology (thin sets, fine limits, Wiener's criterion, harmonic approximation), the Martin boundary (minimal harmonic functions, the Martin representation, the boundary Harnack principle and the Martin boundary of Lipschitz domains) and boundary limits (swept measures and the Dirichlet problem for the Martin compactification, minimal thinness, the Fatou-Naïm-Doob theorem).

Each chapter concludes with a set of exercises, either routine or leading to results from the research literature. At the end of the book, there are brief historical notes and an Appendix where less elemen-

tary results from analysis are stated without proof. The monograph is designed to serve both as a general textbook and as a detailed exposition of the classical topics in potential theory. It should be accessible to graduate students and researchers interested in the field of potential theory, and will be understandable with a basic knowledge of first-year graduate courses in analysis. A knowledge of calculus in higher dimensions, measure theory, very basic topology and linear algebra are required. (jl)

B. Bakalov and A. Kirilov, Jr., ***Lectures on Tensor Categories and Modular Functors,*** *University Lecture Series* ***21****, American Mathematical Society, Providence, 2001, 221 pp., US$29, ISBN 0-8218-2686-7*

The book narrates a big adventure of the 1990s, a 'grand unification' of three seemingly unrelated structures: modular tensor categories, 3-dimensional topological quantum field theories (3D-TQFTs) and 2-dimensional modular functors. Tensor categories are categories with a multiplication that generalises the tensor product in the category of vector spaces. Modular tensor category is then a tensor category with a finite number of simple objects satisfying certain non-degeneracy conditions. The main examples come from representations of quantum groups at unity.

A 3D-TQFT is a rule that assigns to each 2-dimensional manifold a vector space (the state space) and to each 3-dimensional manifold with boundary (thought of as a bordism of 2-manifolds) a linear operator. A slight generalisation allows for 2-manifolds with marked points and 3-manifolds with framed tangles. A 2-dimensional modular functor is a functor from the modular category of 2-dimensional manifolds and isotopy classes of their homeomorphisms to the category of vector spaces. An equivalent definition can be given in terms of flat connections on the moduli space of curves.

The authors explain that these notions are essentially equivalent. The equivalence of tensor categories and 3D-TQFTs is mediated by Resetikhin-Turaev invariants of links and 3-manifolds, while the equivalence with modular functors is based on results of Moore and Seiberg and uses the 'pair of pants' decomposition of surfaces. The book assumes some preliminary knowledge of algebraic/differential geometry and category theory, and is addressed at graduate students and researchers interested in this beautiful part of mathematics with a strong physical flavour. (mm)

R. G. Bartle, ***A Modern Theory of Integration,*** *Graduate Studies in Mathematics* ***32****, American Mathematical Society, Providence, 2001, 458 pp., US$59, ISBN 0-8218-0845-1*

The Kurzweil-Henstock theory of integration is well described in this book. For Kurzweil-Henstock integration, first-year students have no essential difficulties in understanding the main idea of defining the integral, because of its similarity with the Riemann integral. The difference between the definitions of Kurzweil-Henstock and Riemann is at first almost imperceptible. On the other hand, Riemann's approach gives an integral that is very weak from a practical point of view; this was why Lebesgue's theory of integration was created at the beginning of the last century. The Kurzweil-Henstock theory is more general than the Lebesgue one and it overcomes the problem that the Lebesgue integral does not integrate derivatives in general. Another advantage of Kurzweil-Henstock integration is that to explain it, only the concept of the real numbers is needed (the theorem on the supremum) and everything can be done on this basis, including very general convergence results. Along these lines, the author explains the theory for real functions defined on compact one-dimensional intervals in the first part of the book, and then extends it for infinite intervals in the reals. Links with measure theory, measurability and the Lebesgue integral are presented, even though they are not needed for presenting the Kurzweil-Henstock theory (this is one of the merits of the theory). The topics are excellently motivated and the book contains many well-chosen exercises, some of them solved in the concluding part of the book. (šs)

D. C. Benson, ***The Moment of Proof. Mathematical Epiphanies,*** *Oxford University Press, 2001, 331 pp., £9.99, ISBN 0-19-513919-4*

The author acquaints the reader with many topics of mathematics and with related interesting curiosities. But the main aim of this book is to share with a wide range of readers the pleasure of mathematical thinking and the joy of discovery. Readers will frequently experience the pleasure of a sudden insight into a mathematical problem, and many will understand what it means when somebody speaks about the beauty of mathematics, about the elegance of mathematical proofs, and about the charm of mathematical ideas. (ec)

T. Beth, D. Jungnickel and H. Lenz, ***Design Theory, Vols. 1, 2,*** *Encyclopedia of Mathematics and its Applications* ***69*** *and* ***78****, Cambridge Univesity Press, 1999, 607 and 492 pp., £60 and £60, ISBN 0-521-44432-2 and 0-521-77231-1*

This is a new edition of a respectable two-volume set devoted to the study of designs (set systems satisfying strong regularity assumptions). If the first 1985 edition was the first comprehensive treatment of the subject, the second edition comes at a time when there are numerous books that treat the subject in various aspects and depth. The text has been thoroughly revised and complemented to meet new demands and capture some of the latest developments. The authors succeed in doing so, and the present volumes present one of the most thorough treatments of the subject. It is highly recommended for study as well as for content.

The first volume includes examples and basic definitions, combinatorial analysis of designs, and chapters on groups and designs, Witt designs, Mathieu groups and highly transitive designs, a discussion of difference sets and regular symmetric designs, and difference families. The second volume has chapters on recursive constructions, transversal designs and nets, asymptotic existence theory, characteristic of classical designs, and their applications. Together with an appendix, tables, bibliography, a list of symbols and an index, there are 1093 pages in total. (jnes)

S. Billey and V. Lakshmibai, ***Singular Loci of Schubert Varieties,*** *Progress in Mathematics* ***182****, Birkhäuser, Boston, 2000, 251 pp., DM 118, ISBN 0-8176-4092-4 and 3-7643-4092-4*

The study of Schubert varieties started in the nineteenth century as a part of classical projective geometry. A modern treatment of the subject became possible through the works of Ehresmann, Chevalley, Bernstein, Gelfands, Demazure, and the authors of this book. Schubert varieties now provide one of the best understood examples of complex projective varieties, and their properties have been studied in many papers. Thus, the publication of the book is a very timely event. Already by 1964 Chevalley had shown that Schubert varieties are non-singular in codimension 1, and in 1973 Demazure discovered non-smooth Schubert varieties. In the past fifteen years, many major developments in the field have taken place, making it possible to do more elaborate computations on singular loci and to solve questions concerning the smoothness of Schubert varieties. In these questions, contemporary techniques from algebraic geometry, representation theory and combinatorics are needed. All of these techniques are explained with maximum benefit to researchers in the field or graduate students. (ae)

J. Billingham and A. C. King, ***Wave Motion,*** *Cambridge Texts in Applied Mathematics, Cambridge University Press, 2000, 468 pp., £24.95, ISBN 0-521-63257-9 and 0-521-63450-4*

Waves are everywhere. This is the conclusion that will make after reading the book. The authors remind us that whenever we see or hear anything, we do so because of the existence of waves. Every heartbeat and every nerve impulse owes its existence to electrochemical waves. The authors present the topic of waves for advanced undergraduates in applied mathematics.

The book is divided into three sections. The first section begins with a very basic introduction: no special knowledge is needed in order to understand the book. This section deals with the linear theory of waves and covers a wide range of important applications, such as acoustics, gravity waves, shallow water waves, waves in elastic bodies and electromagnetism. The second part of the book presents the basics of the non-linear theory of waves. The theory is again explained through a wide range of applications, including shock waves in traffic, gas dynamics, non-linear water waves, molecular diffusion, and the transmission

of nerve impulses. The last part of the book covers more advanced topics, such as Burgers' equation, the Kortweg-de Vries equation and the non-linear Schrödinger equation.

The book is written very clearly, with many diagrams and figures accompanying the text. There are also photographs, which are rarely to be found in mathematical textbooks. At the end of each chapter there are sufficient numbers of exercises, so that readers can test their understanding of the topics. Although the solutions to exercises are not included in the book, the authors provide an e-mail address from which fully worked solutions can be obtained. The book contains three short appendices that present different systems of coordinates, some results of vector calculus, and a table of useful physical constants. This textbook will be valuable for students of mathematics who wish to apply their mathematics to physics and other fields. (tf)

A. Björner, M. Las Vergnas, B. Sturmfels, N. White and G. Ziegler, *Oriented Matroids,* *Encyclopedia of Mathematics and its Applications* ***46****, Cambridge University Press, 1999, 548 pp., £30, ISBN 0-521-77750-X*
This is the second paperback edition of this book. The main topic of the book, oriented matroids, is an abstract axiomatic generalisation of hyperplane arrangements, point configurations and convex polytopes in geometry, directed graphs in discrete mathematics, and in many other situations. The book describes the basics of the subject and its applications to other areas of mathematics.

In this revised edition there is a new appendix with a summary of research done since the publication of the first edition in 1993. The authors have also updated and substantially expanded the bibliography, which now has more than 50 pages. The book describes a subject situated at the crossroads of many fields of mathematics, and will therefore be interesting for mathematicians in geometry, representation theory, topology, algebraic geometry and computer science, as well as for chemists. (vs)

D. M. Bressoud, *Proofs and Confirmations, Spectrum Series**, Cambridge University Press, 1999, 274 pp., £17.95, ISBN 0-521-66170-6 and 0-521-66646-5*
The area of the book is algebraic combinatorics. The main problem discussed here is a particular question: to find a formula for the number of alternating sign matrices of order n (the non-trivial entries of an alternating sign matrix can be only $+1$ and -1, the sum of the entries in each row or column is 1, and the non-zero entries in each row or column alternate in sign). The author presents a description of the evolution of the subject, starting in the 1980s and ending more than ten years later, leading to a proof of the conjectured formula.

This is a fascinating story, going from classical invariant theory to partitions, symmetric functions, tableaux, various forms of hypergeometric series and vertex models in statistical mechanics, via fourteen interrelated conjectures, to the final goal. The book is written in a very interesting and attractive way, full of ideas, pictures, photographs, historical remarks and many exercises. Furthermore, the special problem described above provides an occasion for the author to discuss very interesting and basic questions concerning mathematics as a whole – what are the roles of conjecture and proof in mathematics?, or more generally, how do mathematicians really do research? This is an excellent book which can be recommended without hesitation, not only to specialists in the field, but to any mathematician with time to read something interesting and nicely written. (vs)

P. Le Calvez, *Dynamical Properties of Diffeomorphisms of the Annulus and of the Torus,* *SMF/AMS Texts and Monographs* ***4****, American Mathematical Society, Société Mathématique de France, Providence, 2000, 105 pp., US$21, ISBN 0-8218-1943-7*
Monotone twist maps are a useful tool in the theory of conservative and dissipative dynamical systems. The first two chapters present a survey of approaches to the theory of such maps, with generalisations, and several motivating examples are given. The Aubry-Mather variational approach is explained, and criteria for the existence of periodic orbits are discussed. The topological approach is used for a description of the dynamics on invariant curves. The second chapter asserts that each diffeomorphism of the closed annulus isotopic to the identity can be represented as a composition of monotone twist maps, and the methods in the first part are used to study diffeomorphisms isotopic to the identity. New proofs of some results concerning the rotation set and periodic orbits of diffeomorphisms of the circle are presented. (šs)

B. Chazelle, *The Discrepancy Method, Randomness and Complexity,* *Cambridge University Press, 2000, 463 pp., £40, ISBN 0-521-77093-9*
This book is written by one of the leaders in the field. It presents a rapidly developing field in admirable breath and depth, and is written in a beutiful style. From the dust jacket description: 'This book tells the story of the discrepancy method in a few short, independent vignettes. It is an eclectic tale that features, among other topics, communication complexity, pseudorandomness, rapidly mixing Markov chains, points on the sphere via modular forms, derandomization, convex hulls, Voronoi diagrams, linear programming, geometric sampling, VC-dimension theory, minimum spanning trees, linear circuit complexity, and multidimension searching.' The topics discussed include combinatorial discrepancy, upper and lower bound techniques, sampling, geometric searching, complexity lower bounds, convex hulls and Voronoi diagrams, linear programming and extensions, pseudorandomness, communication complexity, minimum spanning trees (this contains the best description of the fastest known deterministic algorithm (due to the author: 53 pages).

There are three appendices summarising the necessary background material (probability theory, harmonic analysis and convex geometry). Taken with Matoušek's book (*Geometric Discrepancy: An Illustrated Guide*, Springer, 1999), discrepancy theory is fortunate to have two complementary books of excellent quality written by leaders of the field. This is the first book devoted to the discrepancy method. (jnes)

F. Chung and R. Graham, *Erdös on Graphs**, A. K. Peters, Ltd., Wellesley, 1999, 142 pp., US$25, ISBN 1-56881-079-2*
This is a collection of Paul Erdõs (mostly open) problems related to graphs and hypergraphs, with commentary. The topics treated in the book include extremal Ramsey theory, colouring, packing and covering, random graphs and enumeration, hypergraphs, and infinite graphs. This is complemented by personal reminiscences by the authors, and by A. Vászonyi, one of Erdõs's oldest collaborators. This book also contains an impressive list of survey articles devoted to P. Erdõs, many of which are collected in: *Mathematics of Paul Erdõs I, II* (ed. R. L. Graham and J. Nešetøil), Springer-Verlag, 1996. It would be useful to have similar collections in other branches of Erdõs's activity – number theory, in particular. (jnes)

C. W. Curtis, *Pioneers of Representation Theory: Frobenius, Burnside, Schur and Brauer**, History of Mathematics* ***15****, American Mathematical Society, Providence, 1999, 287 pp., US$49, ISBN 0-8218-9002-6*
Representation theory has made enormous progress in the last century. This book returns to its roots, to the representation theory of finite groups. The principal figures in its development were four excellent mathematicians – Frobenius, Burnside, Schur and Brauer. Building on ideas concerning characters of finite abelian groups, the first steps in the structure theory of finite groups, and research in finite-dimensional associative algebra, they created (with others) a beautiful theory that was subsequently a model and inspiration for further evolution of the representation theory of Lie groups. The book concentrates on the mathematical aspects of their original papers and describes their content and methods, using modern language. The historical aspects are treated as well: a full account of the history of the subject can be found in papers by Thomas Hawkins. This very nice book is accessible with a basic knowledge of algebra, and is recommended. (vs)

H. G. Dales, *Banach Algebras and Automatic Continuity,* *London Mathematical Society Monographs New Series* ***24****, Clarendon Press, Oxford, 2001, 907 pp., £110, ISBN 0-19-850013-0*
This bulky monograph presents a detailed modern account of basic Banach algebra theory. The main chapters are devoted to connections between algebraic and topo-

logical structures for general Banach algebras, as well as for particular examples. The author studies when (and how) algebraic structures determine various aspects of topological ones.

In the first chapter, the algebraic background is established (including ordered sets, algebraic semigroups, ideals, modules, radicals, spectra, valuation algebras, cohomology and involutions); special attention is paid to the use of logic and set theory. The next chapter explains the general theory of Banach algebras as well as some of the theory of more general topological algebras. This chapter also contains sections on the Gel'fand theory, functional calculus, Banach algebras of operators and Banach modules. The third chapter is devoted to Banach algebras with an involution (including C^*-algebras and group algebras). Chapter 4 presents the theory of commutative Banach algebras. After a general introduction, the author studies particular examples (such as algebras of continuous functions, uniform algebras, algebras of differentiable and Lipschitz functions, abelian group algebras, Banach algebras of power series and convolution algebras). The last chapter, the culmination of the book, deals with automatic continuity theory itself. In particular, it treats uniqueness of norm, separating spaces and the stability lemma, continuity ideals and singularity sets, the main boundedness theorem, linear functionals, continuous and discontinuous derivations, and embedding algebras in Banach algebras.

At the end of the book, an appendix gives some background from topological and metric spaces, complex and functional analysis, measure theory, integration and analytic spaces, together with an index of symbols, theorems, identities and examples. A general index and an extensive list of references are included. This voluminous text is recommended to graduate students and experts in the field of Banach algebras, and to those working in functional analysis and in algebra. (jl)

O. Debarre, *Tores et variétés abéliennes complexes,* *Cours Spécialisés* ***6****, Société Mathématique de France, Paris, 1999, 125 pp., ISBN 2-86883-427-2*

The main topic treated in this book is the classical theory of abelian tori. At the beginning of the book, the author briefly reviews the classical facts on lattices and elliptic curves (complex tori, Weierstrass function, divisors, theta functions, the Riemann-Roch theorem and moduli spaces of elliptic curves). Taking these as motivation, the author presents a discussion of many questions concerning complex abelian varieties in higher dimensions. An abelian variety is a complex torus that admits a holomorphic embedding in a projective space: characterising abelian varieties is the central problem in this book. To answer it, the author uses modern tools – holomorphic line bundles, cohomologies with values in a sheaf and Chern classes. This part of the book is quite elementary, and requires only a very modest knowledge; all necessary tools are introduced in the text. The last two chapters are more advanced. Chapter 7 contains a discussion of moduli spaces of polarised abelian varieties. The final chapter contains recent results on the geometry and topology of subvarieties of a complex torus, and needs much more background. Most of the results in this book are fully proved and the presentation of ideas is understandable. This small booklet is very suitable for a course on this topic. (vs)

E. G. Effros and Z.-J. Ruan, *Operator Spaces,* *London Mathematical Society Monographs New Series* ***23****, Clarendon Press, Oxford, 2000, 363 pp., £60, ISBN 0-19-853482-5*

Any normed linear space can be regarded as a 'concrete function space' – that is, as a linear space of bounded functions on a set equipped with the uniform norm. Analogously, a (concrete) operator space is a linear space of bounded operators on a Hilbert space. The authors define an (abstract) operator space by axiomatising the properties of concrete operator spaces. Roughly speaking, operator spaces are linear spaces equipped with an operator space matrix norm. The roots of such a theory of operator spaces go back to the famous Heisenberg uncertainty principle, together with the mathematical work of Jordan, von Neumann and Weyl, and leading to research in the field of algebras of bounded operators on Hilbert spaces. This monograph is concerned with a more recent innovation, the quantisation of Banach space theory.

In a preliminary chapter the reader is introduced to spaces with 'matrix coefficients'. It is followed by a chapter on the three fundamental results in operator theory, and complete proofs of Ruan's representation theorem, the Arveson-Wittstock theorem (a generalisation of the Hahn-Banach theorem) and the Paulsen-Wittstock decomposition theorem for complete contractions; there is also a short section on a characterisation of injective operators spaces. The next chapter concerns tensor products (projective and injective tensor products, the Haagerup tensor product). These are used to generalise Grothendieck's theory of approximation properties. This part discusses nuclear, integral and absolutely summing mappings, including the Dvoretsky-Rogers theorem for operator spaces. In Chapter 4, the central part of the text, the main topics of nuclearity, exatness and local reflexivity are presented. The final chapter is devoted to the algebraic applications of operator space theory (non-commutative harmonic analysis, including quantised Banach algebras and Fourier algebras on locally compact groups). An appendix summarises elementary results from functional analysis (Banach and Hilbert spaces, C^*-algebras, von Neumann algebras, together with a brief list of operator algebras). The authors claim that their 'goal in this monograph has been to explain the deep analogy between linear spaces of bounded functions and linear spaces of bounded operators' and that 'operator space theory will provide Banach space theorists with exciting new vistas for research'.

The monograph is designed for graduate students and researchers interested in the field, and can be understood with a rudimentary knowledge of functional analysis, and in particular of Banach space theory. (jl)

B. Engquist and W. Schmid (eds.), *Mathematics Unlimited — 2001 and Beyondd,* *Springer, Berlin, 2001, 1236 pp., 179 fig., DM 79, ISBN 3-540-66913-2*

The aim of the editors is to give responses and insights to the question: 'What is the future of mathematics in the new millennium?' through this unique collection of more than sixty contributions by leading experts in various fields of mathematics, and 'to provide the reader with a view of great variety and the vitality of mathematics as we enter the new millennium'. Although a similar goal was followed in another recent collection, *Mathematics: Frontiers and Perspectives*, edited by V. Arnold, M. Atiyah, P. Lax and B. Mazur, significant attention is here paid to the newest interactions between mathematics and other disciplines, such as bioscience, economics, material science, communications and computer science, and it is also more focused on 'applied' mathematics. Because of its wide scope, the reader can certainly find within its pages many exciting and thought-provoking papers. (jmal)

R. Estrada and R. P. Kanwal, *Singular Integral Equations,* *Birkhäuser, Boston, 2000, 427 pp., DM 138, ISBN 0-8176-4085-1 and 3-7643-4085-1*

This is a textbook on singular and convolution integral equations. After presenting the basic mathematical tools, the authors outline the basic theory of convolution equations. In Chapter 3, direct methods of solutions of convolution equations are explained, and in Chapter 4, singular integral equations with variable Hölder continuous coefficients are discussed, when the range of integration is either a closed contour or an open arc (the so-called Carleman equation). Chapters 5 and 6 deal with distributional solutions of singular integral equations on a compact interval, as well as on the entire real line; the Hilbert transform is used here. Integral equations with logarithmic kernels with a polynomial are solved in ordinary and generalised spaces of functions in Chapter 7. In Chapter 8, the classical Wiener-Hopf equation with absolutely integrable kernel is solved. Finally, Chapter 9 investigates dual integral equations. The book contains instructive examples and exercises for each particular class of integral equations. It should be very useful for engineers and students. (šs)

M. Flexor, P. Sentenac and J.-C. Yoccoz (eds.), *Géometrie complexe et systèmes dynamiques,* *Astérisque* ***261****, Société Mathématique de France, Paris, 2000, 443 pp., FRF 450, ISBN 2-85629-081-7*

This volume consists of a representative

collection of fifteen papers on dynamical systems, presented at a meeting held in 1995 on the occassion of Adrien Douady's sixtieth birthday. Most of the papers concern various aspects of iterations of real polynomials, especially quadratic ones (Julia and Mandelbrot sets, invariant and Sinai-Ruelle-Bowen measures, Douady-Hubbard theory, and denseness of systems with finitely many attractors of special properties). Also studied are hyperbolic rational maps, Lampert maps, the one-parameter generalisation of the Lorenz model and holomorphic foliations in the complex plane. These proceedings are accessible to experts in dynamical systems, and the lengthy introductions of most papers may also make them available to a wider mathematical community. (jmil)

L. E. Fraenkl, *Introduction to Maximum Principles and Symmetry in Elliptic Problems,* *Cambridge Tracts in Mathematics* ***128****, Cambridge University Press, Cambridge, 2000, 340 pp., £45, ISBN 0-521-46195-2*

This book presents the basic theory of the symmetry of solutions to second-order elliptic partial differential equations, by means of the maximum principle. In Chapter 0, the author sets up the basic notation and termonology. The introductory Chapter 1 is then intended to motivate further investigation. Chapter 2 deals with maximum principles for sub-solutions of elliptic partial differential equations of the second order. In Chapter 3 the author studies the behaviour of positive solutions of the equation $\Delta u + f(u) = 0$, in a bounded symmetric set Ω with $u = 0$ on the boundary of Ω. As a consequence of these results, he shows the spherical symmetry of this solution in the case of a ball. In Chapter 4 the spherical symmetry of a positive solution of the equation $\Delta u + f(u) = 0$ in $\mathbf{R}^m$ is shown. Chapter 5 concerns the monotonicity of positive solutions of the equation $\Delta u + b.grad\ u + f(u) = 0$ in a bounded set. Each paragraph ends with exercices.

The text is accompanied by five appendices. Appendix A is devoted to the study of the Newtonian potential as a solution of the Poisson equation, and the behaviour of this potential and its gradient. Appendix B gives rudimentary facts about harmonic functions and the Poisson equation. The subject of Appendix C is a construction of the first of three comparison functions of a type introduced by D. Siegel. In Appendix D, the divergence theorem is proved. Appendix E presents the edge-point lemma. (dm)

T. W. Gamelin, *Complex Analysis,* *Undergraduate Texts in Mathematics, Springer, New York, 2001, 478 pp., US$49.95, ISBN 0-387-95039-1 and 0-387-95069-9*

It is difficult to describe this textbook in a short review. Among its many aims, the author wishes to provide beginners with standard material in a rather flexible course. About one third of material represents nineteenth-century mathematics (a standard part of any basic course in complex analysis); the second third, which can still be partly covered in an undergraduate course, consists of selected topics such as the Poisson integral and hyperbolic geometry; in the last third, the author presents topics that have applications. The final chapters cover the necessary background for passing PhD qualifying exams in complex analysis.

Surprisingly the book does not need much background: apart from high-school basics, one needs some general understanding of the methods of mathematical analysis and some knowledge of multivariable calculus. The author considers the course to be a good opportunity for students to develop and consolidate previously covered material, and to learn its active use in calculations. The preface contains useful hints for both instructors and students. More than 800 well-chosen exercises with 20 pages of hints and solutions, together with clear and concise expositions of many results, makes this book enjoyable even for specialists in the field. The book is recommended for libraries, students, and teachers of both undergraduate and graduate courses. (jive)

J. J. Gray, *The Hilbert Challenge,* *Oxford University Press, 2000, 315 pp., £20, ISBN 0-19-850651-1*

This book gives a fascinating account of Hilbert's 23 problems, which he presented at the International Congress of Mathematicians in Paris in 1900. The author describes the life and mathematical work of David Hilbert (1862-1943), his influence on the development of mathematics, and his influence on the society of mathematicians. He describes all of Hilbert's problems and shows what they were, why they were proposed, how they influenced the nature of mathematics and of mathematical thinking in the twentieth century, how they were solved, and so on. The reader can enjoy the reactions of mathematicians to the Hilbert problems and appreciate their efforts to solve them. This book is written in a clear and lively manner, and can be recommended to everybody interested in mathematics and mathematicians. (mnem)

E. Györi and V. T. Sös (eds.), *Recent Trends in Combinatorics. The Legacy of Paul Erdös,* *Cambridge University Press, 2001, 192 pp., £35, ISBN 0-521-80170-2*

This book is much more than just a proceedings. It stems from the combinatorial workshop, *Some Trends in Discrete Mathematics*, held in Mátraháza, Hungary, in October 1995. The editors have managed to gather surveys and research papers on the really hot topics of recent discrete mathematics. The style and quality of the contributions are such that the volume can serve as a textbook on special topics suitable for an advanced graph theory and combinatorics seminar, while established researchers will enjoy reading many of the papers describing recent progress in combinatorics and giving a collection of interesting open problems.

The scientific quality of the book is well complemented by its historical and humanistic impact. The Mátraháza meeting was one of the last meetings in which Paul Erdős took part. This famous twentieth-century mathematician was well known, not only for his immense contributions to mathematics (and in particular to discrete mathematics), but also for his unusual life style. It is very appropriate that a volume dedicated to this unforgettable personality should be edited by his former students, colleagues and friends. A long foreward of over ten pages describes his broad work in combinatorics, the importance of his research, and his way of thinking of mathematics as a whole. In addition to the professional line, the foreword gives a rich flavour of Paul Erdős' life, with many stories that reveal his character and help us keep in our minds a picture of a brilliant and unique mathematician, and at the same time a warm and charitable human being. This book contains two contributions by Erdős, one of them being the very last paper he worked on before he passed away in September 1996.

The topics covered in the book also include applications of algebraic techniques in combinatorics and graph theory – in particular, polynomials and graph homomorphisms, combinatorial number theory, discrete geometry and discrepancy, structural graph theory, and specialised topics in random graphs. (jk)

Harish-Chandra, *Admissible Invariant Distributions on Reductive p-adic Groups,* *University Lecture Series* ***16****, American Mathematical Society, Providence, 1999, 97 pp., US$20, ISBN 0-8218-2025-7*

The famous Harish-Chandra results on admissible invariant distributions were presented in Princeton in 1973, and a short version of his lectures was published in his so-called 'Queen's notes' in 1978. Later, he asked P. L. Sally, Jr. to prepare a detailed version of these notes. This small booklet contains notes on this topic prepared by E. DeBacker and P. L. Sally, Jr., which are based on Harish-Chandra's own versions of his lecture notes. The preface also includes comments on later development in the field, after the publication of the Queen's notes.

The main result of the book is the fact that the character of an irreducible admissible representation of a connected reductive p-adic group can be represented by a locally summable function on the group; the main tool used is the Fourier transform of distributions on the corresponding Lie algebra. This result by Harish-Chandra strongly influenced the later evolution of the subject. It is therefore excellent to have a carefully prepared presentation of this topic available in book form. (vs)

M. Kamenskii, V. Obukhovskii and P. Zecca, *Condensing Multivalued Maps and Semilinear Differential Inclusions in Banach Spaces,* *De Gruyter Series in Nonlinear Analysis and Applications* **7***, Walter de Gruyter, Berlin, 2001, 231 pp., DM 196, ISBN 3-11-016989-4*

This monograph gives a self-contained

presentation of the theory of condensing multivalued (= set-valued) mappings, and applies it to semi-linear differential inclusions in Banach spaces. The adjective 'condensing' (with respect to a certain measure of non-compactness) means that the multivalued mapping in question does not increase the specified measure of non-compactness; a (regular) measure of non-compactness says, roughly speaking, how much a given set violates the property 'to be relatively compact'.

Chapter 1 summarises the basic properties of multivalued mappings as far as continuity and measurability are concerned. Chapter 2 then introduces abstract measures of non-compactness, with special attention to Hausdorff measure of non-compactness in separable Banach spaces (and, in particular, in spaces of continuous functions), and introduces basic definitions and properties of condensing mappings. Topological degree theory for condensing both convex-valued and non-convex-valued multifields forms Chapter 3; the theory is briefly illustrated also by applications to optimal control of neutral functional differential equations. Chapter 4 then gives basic facts from the theory of C_0-semigroups of linear operators, with special attention to condensing operators. Measures of non-compactness in Banach-space-valued functions are also addressed. Semi-linear differential inclusions of the type $x'(t) \in Ax(t) + F(t, x(t))$, arising in (for example) hybrid systems with dry friction or in feedback control, are studied in Chapter 5 (initial value problems) and Chapter 6 (periodic problems). To this aim, the multivalued part F is assumed to be condensing with respect to a special measure of non-compactness.

Reading this book from the beginning is recommended, because there is no list of notation and a rather poor index. The book will serve excellently as a self-contained introductory text, as well as a state-of-art survey for researchers and advanced students interested in this branch of non-linear analysis. (trou)

S. Kangshen, J. N. Crossley and A. W.-C. Lun, *The Nine Chapters on the Mathematical Art. Companion and Commentary,* *Oxford University Press, 1999, 596 pp., £110, ISBN 0-19-853936-3*

This book is a scholarly English translation of the Chinese *Nine Chapters on Mathematical Art*, which is considered as the Eastern counterpart of Euclid's *Elements*. It is an anonymous text of more than 2000 years old. It served as a textbook not only in China, but also in neighbouring countries, until around 1600 when Western science was introduced. This book contains a modern translation of the text, together with historical commentaries which are also very old – the best known of these commentaries is by Liu Hui (263 AD): the *Sea Island Mathematical Manual* which is translated in full in Chapter 9. The amazingly complex history is told with rigour and elegance.

This book is of interest to historians of science and to all mathematicians interested in the origins and deeper context of their science. (jnes)

E. Kaszkurewicz and A. Bhaya, *Matrix Diagonal Stability in Systems and Computation,* *Birkhäuser, Boston, 2000, 267 pp., DM 168, ISBN 0-8176-4088-6*

In this book, the authors discuss a special class of stability results for dynamical systems described by a system of difference or ordinary differential equations. The book starts with a chapter that gives an overview of several applications where the stability of systems can be investigated using diagonal-type Lyapunov functions. In the second chapter, the reader can find a thorough introduction to the concepts of diagonal stability and D-stability in the framework of matrix theory. The next chapter deals with certain classes of dynamical systems that admit the diagonal-type Lyapunov functions and gives the basic stability results. The authors discuss the cases of non-linear systems, systems continuous and discrete in time, and systems with time-varying delays in the state. In the remaining three chapters, these methods are applied to certain problems introduced in the first chapter – namely, the problem of convergence of an asynchronous iterative method, stability of the neural networks, circuits, ecosystem models and large-scale systems.

The book is self-contained, includes both classical and new results presented in an unified way, and includes a great variety of useful references. (jhr)

S. B. Kuksin, *Analysis of Hamiltonian PDEs,* *Oxford Lecture Series in Mathematics and its Applications* ***19****, Oxford University Press, 2000, 212 pp., £39.50, ISBN 0-19-850395-4*

The aim of this book is to present the following form of the proof of Kolmogorov-Arnold-Moser (KAM) theorem: most of the space-periodic finite-gap solutions of a Lax-integrable Hamiltonian partial differential equations (PDE) persist under a small perturbation of the equation as time-quasiperiodic solutions of the perturbed equation. This theorem provides an important tool for an effective study of non-linear PDEs.

In Chapter 1, the theory of Hamiltonian PDEs is developed. The presentation of abstract Lax-integrable equations is given in Chapter 2. The properties of classical Lax-integrable PDEs are discussed in next two chapters. The following three chapters contain a description of normal forms for Lax-integrable PDEs in the vicinity of manifolds, formed by finite-gap solutions. The final three chapters contain the proof of the main theorem. A number of technical details are explained in the Addendum.

The book is devoted to global aspects of the KAM theorem for PDEs, and does not include two local theories, perturbations of linear equations and small oscillations in non-linear equations. (pso)

P. Y. Lee and R. Výborný, *The Integral: An Easy Approach after Kurzweil and Henstock,* *Australian Mathematical Society Lecture Series* ***14****, Cambridge University Press, 2000, 311 pp., £24.95, ISBN 0-521-77968-5*

As the title of the book suggests, the Kurzweil-Henstock theory of integration is dealt with. Introductory topics are included to the first chapter, while in the second, the basic defintion of the integral is given, with its important basic properties. More sophisticated topics are given in Chapter 3, including the convergence theorem for Kurzweil-Henstock integrals, based on the concept of equi-integrability of a set of functions, and the McShane integral, which is equivalent to the Lebesgue integral and can be also defined by using Riemann-type integral sums for certain partitions of an interval. In Chapters 4 and 5, the strong Luzin integral is defined and is shown to be that it is equivalent to the Kurzweil-Henstock integral. This part of the book mentions more advanced concepts concerning real controlled convergence results, including AC^* and BV^* functions, as we know them from the classical book of S. Saks and P. Y. Lee. In Chapter 6, the integration of functions over n-dimensional intervals is presented, with Fubini-type theorems and change of variables (substitution). At this point, the authors mention that, because the Kurzweil-Henstock integral is a non-absolutely convergent integral, the integration over n-dimensional sets causes difficulties that can be overcome by looking for absolutely Kurzweil-Henstock integrable functions. The last chapter of the book is devoted to some applications of the previous theory to problems in analysis (line integrals, Green's theorem, Dirichlet problem, Fourier series, etc.).

The book is well written, is suitable for use in elementary courses as well as for graduate studies, and can be recommended for a wide audience of students and specialists in the theory of integration and real analysis in general. (šs)

S. Morosawa, Y. Nishimura, M. Taniguchi and T. Ueda, *Holomorphic Dynamics,* *Cambridge Studies in Advanced Mathematics* ***66****, Cambridge University Press, 2000, 338 pp., £45, ISBN 0-521-66258-3*

This book is a comprehensive introduction to holomorphic dynamics, induced by iterations of holomorphic maps. It is well known that even iterations of a quadratic polynomial can produce very complicated fractals. The first part of the book (Chapters 1-5) is devoted to dynamics on domains in the Riemann sphere, while the rest (Chapters 6-9) treats the case of two complex variables.

In Part I, Chapter 1 summarises the basic facts on iterations of a polynomial near a fixed point. A dichotomy with respect to the dynamics of a given rational or entire function (Fatou and Julia sets) is investigated in Chapter 2, where important properties of both sets are explained. Chapter 3 describes phenomena typical for entire functions. Chapter 4 starts with the Newton iterations for zeros of a meromorphic function and continues with the Fatou-Julia-Sullivan theory of iterations of

rational functions and Shishikura's estimate. The last chapter of the first part is devoted to the so-called 'conformal dynamics' (group actions of Kleinian groups) and to the Sullivan dictionary of analogies between iterations of holomorphic functions and actions of a Kleinian group; this chapter also contains several recent conjectures related to the main one: structurally stable rational functions are hyperbolic.

Part II starts with a brief introduction to the analysis of several complex variables. Chapter 6 explains the behaviour near a fixed point (including stable and unstable manifolds). Chapter 7 studies polynomials, especially complex Hénon maps. The last two chapters are devoted to a measure-theoretic treatment of dynamics which is based on the so-called 'pluripotential theory'.

Since complex dynamics is a modern subject, the book contains many recent results. Even though the text is almost self-contained and very carefully written, the reader needs a good background knowledge of the classical geometric theory of a complex variable (e.g., from Ahlfors' books) and some experience of topology and measure theory. (jmil)

T. W. Palmer, *Banach Algebras and the General Theory of *-Algebras, Vol. II: *-Algebras,* *Encyclopedia of Mathematics and its Applications* ***79****, Cambridge University Press, 2001, 822 pp., £75, ISBN 0-521-36638-0*

This is the second volume of a two-volume set on Banach algebras and *-algebras; the first volume appeared in 1994, also in the *Encyclopedia of Mathematics and its Applications* series. It provides a modern account of basic Banach algebra theory and deals with *-algebras.

It is difficult to describe in detail the contents of this voluminous monograph. The author starts with a chapter devoted to *-algebras, emphasising their structure and exploring the algebraic results (*-representations, linear maps, irreducible *-representations and hermitian and symmetric *-algebras) that underlie the theory of Banach algebras and *-algebras. The next chapter deals with special *-algebras (G*-algebras, BG*-algebras, T*-algebras, S*-algebras, Sq*-algebras, U*-algebras, hermitian U*-algebras and γS*-algebras). In the subsequent chapter the author extends nearly all the results previously known for Banach *-algebras and hermitian Banach *-algebras (which include C*-algebras as a very special case) to *-algebras with various algebraic restrictions (including automatic continuity for Banach *-algebras and results for Hilbert and Tomita algebras). The final chapter is devoted to locally compact groups (including the study of connected groups, Lie groups, totally disconnected groups and group representations) and *-algebras related to them.

This second volume of the set is accompanied by a wealth of historical remarks and examples. At the end, an extensive bibliography is attached. The volume also contains unpublished results with complete proofs at a graduate student level. This two-volume set is recommended both for graduate students and experts in the field of *-algebras. (jl)

M. M. Postnikov, *Geometry VI. Riemannian Geometry,* *Encyclopaedia of Mathematical Sciences* ***91****, Springer, Berlin, 2001, 503 pp., DM 199, ISBN 3-540-41108-9*

This book is a more-or-less standard introduction to Riemannian geometry, including its global aspects. It has strong intersections with some well-known textbooks (Gromoll-Klingenberg-Meyer, Kobayashi-Nomizu, Helgason, etc.). What is non-standard here is the order of the chapters, where the really introductory chapters are put at the end of the book.

Two chapters are of particular interest: Chapter 5 about symmetric spaces, where the algebraic approach of O. Loos is explained, and Chapter 24 on four-dimensional manifolds, which is a real masterpiece that includes many global results. Many interesting and non-trivial exercises are included in every chapter.

On the other hand, this monograph has some weaknesses. First, even though the author refers to many famous names throughout the book, he never gives standard references: instead of usual list of references he gives only a short list of 'suggested reading' at the end of the book. This seems rather unusual for an 'encyclopedia' book. Secondly, in some places, the information is so fragmentary that it becomes useless. For instance, on page 54 there is a special paragraph called 'Semi-symmetric spaces', which includes only a definition and the trivial statement that all locally symmetric spaces are semi-symmetric. Perhaps the author has no idea about the recent developments in this highly non-trivial topic, starting with the fundamental paper by Z. Szabó (*J. Differential Geometry*, 1982). This paper shows, in fact, that the locally symmetric spaces form a 'subset of measure zero' in the class of all semi-symmetric spaces. (ok)

H. Reiter and J. D. Stegeman, *Classical Harmonic Analysis and Locally Compact Groups,* *London Mathematical Society Monographs New Series* ***22****, Clarendon Press, Oxford, 2000, 327 pp., £60, ISBN 0-19-851189-2.*

The original book, *Classical harmonic analysis and locally compact groups*, by H. Reiter appeared in 1968. Reiter died in 1992, and his former student Jan Stegeman was asked by Oxford University Press to prepare a new edition. He decided to stay close to the original text whenever possible, but nevertheless, the new edition has expanded and additional material has been appended.

The text starts with classical harmonic analysis (Fourier transforms, the Wiener approximation theorem, and subalgebras of $L^1(\mathbb{R}^n)$). The next chapter introduces certain topological algebras (Wiener algebras) and an abstract version of the Wiener theorem; Ditkin sets, ideals in function algebras and sets of spectral synthesis are also studied. The next chapter concerns the Haar measure on locally compact groups, algebras $L^1(G)$, $L^\infty(G)$ and Beurling algebras. The fourth chapter deals with locally compact abelian groups and their duality theory. Further chapters are devoted to functions on locally compact abelian groups, an extension of the Wiener theorem for groups, and Segal algebras. The notion of the spectrum of a bounded measurable function and its properties are explained in Chapter 7. The final chapter describes functions on general locally compact groups, including the Mackey-Bruhat theorem on the existence of quasi-invariant measure. The appendix contains proofs of the Domar and Malliavin theorems, additional material on Segal algebras and the notion of difference spectrum. The book ends with notes and additional references to each of the chapters.

The monograph is designed to serve both as a general survey and as a detailed exposition of the topics it treats. It should be accessible to graduate students and researchers interested in harmonic analysis and understandable with a basic knowledge of functional analysis and measure theory, together with a background of real and complex analysis. (jl)

J. Rossmann, P. Takáè and G. Wildenhain (eds.), *The Maz'ya Anniversary Collection, Vols. 1, 2,* *Operator Theory Advances and Applications* ***109****,* ***110****, Birkhäuser, Basel, 1999, 364 and 352 pp., DM 238 and 238, ISBN 3-7643-6203-0 and 3-7643-6202-2*

The contributions to these volumes are dedicated to V. G. Maz'ya, and are partly based on talks given at the conference 'Functional Analysis, Partial Differential Equations and Applications' held in Rostock in September 1998. Vladimir G. Maz'ya is the author and co-author of more than 300 publications and more than a dozen books, and he made significant contributions to many fields of mathematics, extending to the theory of Sobolev spaces, capacity theory, boundary integral methods, qualitative and asymptotic methods of analysis of linear and non-linear elliptic boundary value problems, the Cauchy problem for elliptic and hyperbolic equations, the theory of multipliers in spaces of differentiable functions, maximum principles for elliptic and parabolic systems, and boundary value problems on domains with singularities.

A major part of the first volume consists of four surveys of his work in various fields of mathematics, while other articles in this volume have their origin in his joint work with their authors. The first contribution, by L. I. Hedberg, deals with Maz'ya's early results in the theory of function spaces, potential theory and partial differential equations, including his counter-examples to the regularity theory, which in a substantial way extend the results of E. De Giorgi and E. Giusti, and M. Miranda. In the second survey article, N. G. Kuznetsov and B. R. Vainberg discuss results concerning the unique solvability of two fundamental problems of steady-state surface-wave theory: the problems of time-har-

monic water waves and of a wave pattern caused by a body in uniform forward motion in calm water. In the third part, J. Elschner describes Maz'ya's work on integral and pseudodifferential operators, while in the fourth, J. Rossman reviews Maz'ya's results in the theory of boundary-value problems on non-smooth domains; the domains considered here can have point singularities, edges or polyhedral vertices. The contributions based on joint work with V. G. Maz'ya include papers written by V. Havin, G. Schmidt, R. Cooke, A. Grigoryan and T. Shaposhnikova.

The second volume contains most of the invited lectures, as well as a few contributed papers. There are nineteen contributions, ranging from function spaces (the Hardy inequality, maximal operators and multipliers in Lizorkin-Triebel space), via the qualitative theory of differential equations (maximum and anti-maximum principles for certain classes of systems, perturbation of trajectory attractors for dissipative hyperbolic equations, and symmetry and asymmetry of positive solutions to a class of semilinear equations), the spectral theory of differential operators (eigenfrequencies of fractal drums and the discreteness of the spectrum for the Schrödinger operator on certain manifolds) to results coupling a continuous description with discrete models and numerical results (coupling of finite and boundary element methods for the time-harmonic Maxwell equations, and hybrid methods for boundary value problems via boundary energy).

This is a useful publication giving a good overview and many interesting results in this vast field. (jsta)

C. Sabbah, *Equations différentielles à points singuliers irréguliers et phénomène de Stokes en dimension 2,* *Astérisque* ***263****, Société Mathématique de France, Paris, 2000, 190 pp., FRF 150, ISBN 2-85629-085-X*

The study of systems of linear differential equations in one complex variable around a singular point is an old classical subject that goes back to Riemann and Fuchs. In the case of a regular singularity (the Fuchs condition), the solutions have at most polynomial growth near the singularity. The higher-dimensional analogues of equations with regular singularities are well developed using the language of flat connections on vector bundles, and far-reaching beautiful generalisations of classical results are available describing the appropriate Riemann-Hilbert correspondence.

The situation is much more complicated in the case of equations with irregular singularities. This case includes a lot of interesting examples, such as the Bessel equation, the Whittaker equation, the Airy equation, and many others. The solutions of such equations no longer have polynomial growth near the singularity, and formal solutions are almost always divergent. Analytic solutions are defined only in a sector with its vertex at the singularity point, and their asymptotic relation to formal solutions changes when the boundary of the sector crosses the so-called 'Stokes lines'. Such a Stokes phenomenon is a deep-lying characteristic of the given differential equation. A quite complete theory is available in the case of one variable.

The topic treated in the book is the asymptotic theory of holonomic linear differential equations for two complex variables with irregular singularities. The problem is formulated in the language of flat connections for a meromorphic vector bundle on a complex analytic surface. In the first chapter, the key notion of a good formal structure for a meromorphic vector bundle with a flat connection is introduced and discussed. The second part is devoted to a study of the Stokes phenomenon for connections that admit a good formal structure. The third part of the book studies analogues of Turrittin's theorem from dimension 1, concerning the existence of a good formal structure for a meromorphic connection (on the pull-back by a sequence of complex blowing-up) and their consequences. The existence proof is given for bundles of rank at most five. Throughout, the author freely uses the modern language of sheaves, D-modules and corresponding functors.

The book presents a systematic treatment of the results published or announced by the author in the last ten years. (vs)

P. L. Sachdev, *Self-Similarity and Beyond. Exact Solutions of Nonlinear Problems,* *Monographs and Surveys in Pure and Applied Mathematics* ***113****, Chapman & Hall/CRC, Boca Raton, 2000, 319 pp., £63.99, ISBN 1-58488-211-5*

As its title suggests, the main aim of this monograph is to find exact solutions for problems described by non-linear partial differential equations (PDEs). For this purpose, several techniques and approaches are considered. Starting from self-similar transforms that are useful in finding the asymptotic behaviour of solutions, a construction of a blow-up solution and a better understanding of the structure of the problems, the author presents the systematic group transform approach and the direct Clarkson-Kruskal method for finding such self-similar solutions, and also provides such further techniques as travelling wave solutions, exact linearisation (as the hodograph method) of non-linear partial differential equations, the infinite series method, and embedding special solutions into a more general class in order to obtain solutions of non-linear PDEs of a more general character than self-similar ones. The methods iand their limitations are clearly explained, and are complemented by a number of solved examples focusing on equations in fluid mechanics and nonlinear diffusion. (jmal)

J. L. Schiff, *The Laplace Transform: Theory and Applications,* *Undergraduate Texts in Mathematics, Springer, New York, 1999, 233 pp., DM 79, ISBN 0-387-98698-7*

The book introduces the Laplace transform and the related complex variable theory in a beautiful, pedagogical and rigorous way. Through a large number of examples and exercises, it is shown that the Laplace transform is an extremely useful tool in solving linear problems, including ordinary differential equations with constant coefficients or time delay, or time-dependent coefficients, integro-differential equations, difference and partial differential equations, and problems with Dirac distribution (via the Riemann-Stieltjes integral). All assertions are proved.

This clearly written undergarduate textbook can be recommended to students and teachers of this subject, both in a mathematical and engineering context. (jmal)

J. C. Simo and T. J. R. Hughes, *Computational Inelasticity,* *Interdisciplinary Applied Mathematics* ***7****, Springer, New York, 1998, 392 pp., DM 129, ISBN 0-387-97520-9*

This book deals with numerical simulation for classical non-controversial elastoplasticity models, avoiding any problems arising from pattern formation or material instabilities. However, large-strain elastoplasticity is covered. The ideas of linear elastoplasticity are clearly explained, first in one-dimensional setting. Then the models are generalised to three dimensions. This is followed by a very clear and detailed explanation of time (backward Euler) and finite element (mixed formulation for displacements, stresses and strains) discretisations. Next, the authors proceed to large-strain models and their numerical approximations, completed by numerical tests. This is followed by the objective finite-difference approximations of the frame-invariant time derivative of tensors. Finally, linear viscoelasticity models are treated.

This book is well written, is easy to follow, and contains much useful material for researchers and graduate students in various branches of engineering and applied mathematics. (jmal)

C. Truesdel and K. R. Rajagopal, *An Introduction to the Mechanics of Fluids, Modeling and Simulation in Science, Engineering and Technology,* *Birkhäuser, Boston, 2000, 277 pp., DM 148, ISBN 0-8176-4012-2 and 3-7643-4014-2*

This textbook acquaints the reader with continuum equations of fluid motions, in an elementary but precise way. The authors restrict themselves to isothermal processes. Although compressible Euler equations are also treated, the main emphasis is on incompressible fluids: the book deals with general simple fluids under the incompressibility constraint, the linear (Navier-Stokes) fluid, the inviscid (Euler) fluid, and some second- and third-degree examples of non-linear fluids. The equations are correctly derived and enormous simple flows for these fluids are introduced, computed and analysed. Among other topics, monotonous motions, viscometric flows, and flows in simple geometries (both steady and unsteady) are considered. Each section contains several valuable exercises; readers can verify their

solutions with those provided in an appendix.

This book will be appreciated by those desiring a better understanding of fluid motions. (jmal)

J.-L. Waldspurger, *Intégrales orbitales nilpotentes et endoscopie pour les groupes classiques non ramifiés,* *Astérisque* ***269****, Société Mathématique de France, Paris, 2001, 449 pp., FRF 400, ISBN 2-85629-096-5*

Let F be a finite extension of Q_p, let G be an unramified classical group (orthogonal, symplectic or unitary) over F, and let g be the Lie algebra of G. Denote by D^G_{nil} the space of invariant distributions supported in the nilpotent set on $g(F)$, and by $D^{G,\mathrm{st}}$ the space of stably invariant distributions on $g(F)$. Let H be an elliptic unramified endoscopic group of G. The main results of this work (assuming that p is large enough) are an explicit description of the intersection of D^G_{nil} and $D^{G,\mathrm{st}}$, and an explicit description of the transfer map from the intersection of D^H_{nil} and $D^{H,\mathrm{st}}$ to D^G_{nil}. The proofs use earlier results of the author, relating D^G_{nil} to distributions with integral support, and detailed calculations based on the Springer correspondence and the Lusztig Fourier transform. (jnek)

R. Wilson and J. Gray (eds.), ***Mathematical Conversations. Selections from the Mathematical Intelligencer****, Springer, New York, 2001, 488 pp., DM 119, ISBN 0-387-98686-3*

This book contains forty articles that were published in *The Mathematical Intelligencer* during its first eighteen years. The editors have chosen a wide selection of articles, so as to present the most important and surprising mathematical ideas. The articles are divided into seven groups.

The first part, *Interviews and Reminiscences*, contains two interviews with leading figures from today's mathematics, three reminiscences and memoirs, and one article with mathematical anecdotes. The second part, *Algebra and Number Theory*, shows in six articles some of the most important and significant problems in the field (for example, the proof of the Mordell conjecture, the representation theory of finite groups, and quaternionic determinants). The third part, *Analysis*, also has six articles, describing some interesting discoveries (including the Banach-Tarski theorem, Painlevé's conjecture and a geometrisation of Lebesgue's space-filling curve). Five articles in the fourth part, *Applied Mathematics*, demonstrate that physics remains at the core of applied mathematics; in particular, a combination of interesting topics and new kinds of mathematics contribute to the current revival of applied mathematics. The fifth part, *Arrangements and Patterns*, contains five articles devoted to questions of collaboration between modern artists and mathematics; here, readers can enjoy a rich mixture of mathematical, artistic and cultural themes, including articles on Celtic knotwork, mathematical art, and the pavement of the Baptistery of San Giovanni in Florence. The sixth part, *Geometry and Topology*, explains in six articles some of the most famous discoveries since the 1960s (instantons and the topology of 4-manifolds, the computer-aided discovery of new embedded minimal surfaces, hyperbolic geometry, and moduli spaces of Riemann surfaces). The final part, *History of Mathematics*, includes six articles that describe the everyday life of mathematicians (their lives, work, interaction, and collaborations); these articles are devoted (for example) to Kurt Gödel, Hilbert and Brouwer, and the history of the Bieberbach conjecture. (mnem)

List of reviewers for 2001

The Editor would like to thank the following for their reviews this year:

J. Andìl, J. Antoch, M. Nìmcová-Beèváøová, L. Bican, M. Brzezina, J. Bureš, E. Calda, M. Dont, A. Drápal, J. Dupaèová, A. Elashvilli, E. Fašangová, M. Feistauer, T. Fürst, J. Hron, M. Hušková, V. Janovský, J. Ježek, O. John, A. Karger, J. Kofroò, O. Kowalski, J. Kratochvíl, P. Kùrka, P. Lachout, M. Lichá, J. Lukeš, J. Málek, J. Malý, M. Markl, J. Matoušek, D. Medková, J. Milota, J. Mlèek, K. Najzar, J. Nekováø, J. Nešetøil, I. Netuka, B. Novák, Š. Porubský, D. Pražák, P. Pyrih, M. Rokyta, T. Roubíèek, Š. Schwabik, J. Slovák, P. Somberg, V. Souèek, J. Stará, Z. Šír, J. Štìpán, J. Trlifaj, V. Trnková, J. Tùma, J. Vanžura, J. Veselý, J. Vybíral, M. Zahradník, K. Zimmermann.

All of these are on the staff of the Charles University, Faculty of Mathematics and Physics, Prague, except M. Markl, D. Medková and J. Vanžura (Mathematical Institute, Czech Academy of Sciences), M. Nìmcová-Beèváøová and Š. Porubský (Technical University, Prague), J. Nekováø (Cambridge University, England) and J. Slovák (Masaryk University, Faculty of Natural Sciences, Brno).